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LOCATION OF FURNACE:

Locate furnace and casting area at least four feet from the wall, across the room from windows or ventilation openings . Such openings should face to the direction of the prevailing wind. As fresh air is drawn in through the ventilation openings orwindows, it will sweep across the shop floor and over the casting and furnace area. It will then be drawn out with the fumes and heat through the hoods and exhaust system.

NEVER LOCATE A FURNACE WHERE WORKING ROOM IS RESTRICTED OR THE AREA IS HARD TO VENTILATE PROPERLY. A'HOT CORNER' is both dangerous and uncomfortable.

IMPORTANT NOTICE:

When connecting the blower to the furnace body, run the scanner cable and the spark wire on opposite sides of the manifold pipe so that they do not touch each other. Should the wire and the cable come within 2 inches of each other, the scanner could obtain a bad reading resulting in a start failure.

INSTALLATION

GAS SERVICE LINE:

The gas connecting line should be one pipe size larger than the gas inlet size of the mixer. Main gas line shut off valves must be full flow design to insure maximum gas flow. Natural gas pressure should be at least four ounces at the gas shut off cock with the furnace operating at the maximum firing rate. Low gas pressure or inadequate volume will result in flame fluctuation, improper firing, and slow heating. The easier method of determining whether or not you have sufficient gas supply to operate the furnace correctly is to operate the furnace with the blower air adjusting valve completely open. At this setting, there should be excess gas available. If excess gas is not available, the utility company may be able to increase gas line pressure, and use a step down pressure regulator at the furnace gas solenoid valve. Maximum gas pressure allowable by the solenoid valve manufacturer is 2 lbs. THE GAS COMPANY SHOULD BE CONSULTED FOR ADEQUATE PIPE SIZING ON INITIAL INSTALLATION, or where pressure drop is a problem.

The Speedy Melt gas-air mixers will operate efficiently on natural, manufactured, or bottled fuel gas. There are no metering jets, orifices, or spuds to change or remove. When using MANUFACTURED OR BOTTLE GAS as fuel, the utility company should be advised of the furnace BTU rating, so adequate service can be installed. A HIGH FLOW GAS REGULATOR should be set to hold at least eight inches minimum W.P. with the furnace operating at minimum input.

FURNACE SET UP:

Set furnace in a permanent location and connect the motor blower gas-air mixer assembly to the furnace manifold by joining both halves of the pipe union. Connect the spark electrode and Ultra Violet scanner leads to the top left burner. Connect power leads per wiring schematic. Check air for correct rotation.

If the furnace is supplied with a hydraulic operated tilting system, bolt the hydraulic assembly to the rear lower side of the right furnace upright. Make hydraulic hose connections and electric power connections per appropriate schematic drawings, which are part of this manual.

Secure furnace base to floor using lag bolts through channel base lugs. Secure turbo blower to floor by similar method. Fill hydraulic system with **hydraulic oil** shipped with the furnace. Refer to bulletin contained within this manual for complete specification details and availability. The hydraulic system has heen filled and tested and should not have air in it in any great quantity. If there does seem to be any soft or spongy effect when it is operated, the hose fittings at four different points may be loosened.

With the pump ON and the control level pushed slightly in the UP position, loosen fittings No. 1 and 2 (refer to Page No 11) until the oil comes out freely. Again, with the pump ON and the control lever in the DOWN position, loosen fittings 3 and 4 until the oil flows freely. Should the pump not start delivering oil right away, it will be necessary to remove the hose at fitting No. 5 at the pump outlet, to let the air out of the pump. Hold a gallon can in front of the fitting and jog the pump. **Be sure the pump is rotating in the direction of the arrow. Rotation can be determined by observing the rotation of the cooling fan on the back of the motor.** Raise and lower the furnace several times completely to get whatever air is left out of the system. Your hydraulic system is supplied with oil. Specifications on the oil are in a later chapter.

The lid lift is furnished with a bolt in the support arm which goes through the lid stop. This bolt must be

in place before the furnace is tilted or the lid will fall out on the floor.

The time required to tilt or lower the furnace can be varied by adjusting the flow control needle valves - (refer to Page No. 11) located in the two hydraulic lines connected to the bottom section of the lever/cam operated directional control valve.

If the furnace is a manual nose pivot tilt model requiring a separate hoist to tilt the furnace, the hoist should have a minimum capacity equal to the shipping weight of the furnace. Use electric cable or chain hoists with the lowest rated feet of lift per minute for better control during tilting. Adjustable air hoists or manual chain hoists are satisfactory. The selection and installation of the manual tilting facilities is the responsibility of the purchaser. Attention should be directed to any safety codes or similar requirements at time of installation.

The center pivot tilting furnaces are designed with a worm and worm gear box unit. The hand wheel operated manual tilt design gives infinite control of the pouring rate of metal from the crucible. The electric operated tilt is available in 115/230 volt, single phase or 230/460 volt, three phase, electrical service.

POURING FLOOR:

It is a good practice to install the furnace on a "pad" of tamped molding sand, clay, or loam, since molten metal or constant heat will damage a concrete floor. By extending the size of the pad into a pouring floor - a safe pouring area can be added to the casting area. A satisfactory pad can be made in the shop by welding a rectangular framework of angle iron. Size will depend on the room available and the instructor's preference, but the pad should be large enough for the fumace plus eight molds. The inner area is then piled and tamped with old molding sand or foundry clay. The pad should be at least two inches thick. Expanded metal, laid on the surface of the earthen pad will help prevent tracking earth or clay through the shop area.

FURNACE OPERATION AND STARTUP:

Locate the crucible block in the center of the furnace chamber. ALWAYS use the correct size block and NEVER place the crucible on the floor of the furnace over the drain hole. Doing so causes a cold spot at the bottom of the crucible and retards melting. The block locates the crucible at the proper height for the hottest combustion and reflected heat. If the crucible sticks to the base block, apply fine graphite or silica flour to the top of the block, or wet a piece of corrugated cardboard and drop on the base block just before the crucible is set in place. If the furnace is cold, use the cardboard dry. The paper will char and form a parting layer between the block and the crucible. DO NOT CHARGE METAL THROUGH, OR OBSTRUCT THE LID EXHAUST HOLE IN ANY MANNER WHILE IN OPERATION. If the crucible breaks while in the furnace, the molten metal will flow out the drain at the bottom of the furnace.

A layer of high temperature refractory insulation is cast between the pre-burned brick lining and the steel furnace shell. This increases melting efficiency and holds heat loss through the fumace walls to a minimum. Since the insulation is a castable material, a certain amount of moisture is absorbed by the furnace lining. It is recommended that the initial firing periods should not exceed fifteen minutes, to allow the lining to expel the moisture slowly. The moisture may appear as steam or drops of water. Two or three short firing periods will be sufficient to remove excess moisture.

Instructions in the USE AND CARE OF GRAPHITE CRUCIBLES should be followed as closely as possible. This practice is routine in the foundry trade, and will increase crucible life and prevent failure due to cracking and spalling.

NOTE OF CAUTION WHEN MELTING ALUMINUM:

Due to the high velocity of the flame and the light weight of molten aluminum, THE FURNACE SHOULD BE THROTTLED TO HALF FIRING RATE DURING THE LAST HALF OF THE MELTING CYCLE, or after the aluminum has reached the PLASTIC or MUSHY state. If the furnace is fired at maximum rate when the aluminum is molten and ready to pour, THE HIGH VELOCITY FLAME WILL PICK UP ALUMINUM PARTICLES FROM THE CRUCIBLE AND EXPEL THEM THROUGH THE TOP EXHAUST HOLE. This condition will not be experienced with heavier metals such as brass or gray iron.

At maximum firing rate, the Speedy Melt Series of furnaces are noisy. This is due to the high velocity flame and the amount of BTU's generated within the combustion chamber to obtain the rapid melting cycles. If the noise is objectionable, the furnace can be operated at a lower input rate with slightly slower melting cycles. However, for melting gray iron, the furnace must be fired at maximum input.

The exposed refractory should periodically be cleaned thoroughly and coated with a refractory sealer. A separate section called "REFRACTORY MAINTENANCE" gives detailed instructions (see following page).

REFRACTORY MAINTENANCE:

All MIFCO furnaces are constructed with hard, pre-burned, sectional refractory shapes. Each brick is made by air ramming the granular refractory particles into a steel mold, forming the desired shape. The shape is removed from the mold, dried to remove all moisture, then fired. Defective bricks that fail during the final burning and are discarded. This assures controlled quality refractory for all MIFCO furnaces before assembly into a furnace lining.

We can control quality through the point of manufacture of the furnace, but preventative maintenance is necessary for maximum productive life of the furnace lining. The exposed surfaces of the refractory lining should be resealed when scuffing and wear takes place.

MINRO-WASH REFRACTORY SEALER FOR FURNACE LININGS:

The basic refractory used for our sealer is ground to a very fine powder. It is then mixed with a water soluble bonding agent which develops a mechanical bond to the refractory. When the furnace is fired to a high temperature, the bonding agent burns out and the refractory sealer forms a ceramic bond with the furnace lining. It is available in twenty pound bags and should be stored in a dry warm area. Prepare only the quantity to be used at one time for one application.

PLASTIC REFRACTORY PLASTIC PATCHING MATERIAL:

If the refractory lining has been chipped or broken, and the damaged areas are too large to be filled with refractory sealer, they should be filled with patching material. The plastic patching material consists of the same refractory as the sealer, except a coarser grain size is used. It is a medium grained, heat setting mix that should be thoroughly tempered with water before use. The material not used must be discarded. Mix with water only the amount needed each time.

APPLICATION OF SEALER AND PATCHING MATERIAL:

Remove all loose scale and foreign material from the surface to be sealed. Wire brush to remove flux and old loose sealer. Excessive flux and spilled metal are detrimental to refractory and should be removed. Prepare the surface by priming with a saturated solution of sodium silicate. This material is available from drug supply houses. Brush or sponge the solution liberally on the refractory.

The refractory patching material should be used at this point to fill larger holes. Saturate damaged areas with primer or water. This forms a strong bond between the refractory and patching plastic. Place a layer of patching plastic with a maximum thickness of 1/8" into the area being filled. The thin patch should be allowed to dry for one hour, then heat the area to a red temperature by using the furnace. When the furnace has cooled, add another thin layer, not exceeding 1/8" thickness over the original layer, using the above instructions for the second patch. Successive thin layers should be applied and burned, until the patch conforms to the original contour of the furnace lining. If the procedure of applying and burning in the successive thin layers is not followed, and a heavy patch is used to fill the damaged area, the moisture retained in the center of the heavy patch will generate sufficient steam to cause it to rupture and peel.

After the primer has been applied, and any severely damaged sections have been repaired with plastic patching, prepare the sealer as follows:

Step 1. Use one pint of warm water in a metal container.
Step 2. Sift the refractory into the water while stirring constantly.
Step 3. Allow the mixture to set overnight to completely dissolve the bonding agent.

Step 4. Remove the lid from the furnace so both the bottom and top surfaces can be sealed. With the use of a sponge, saturate exposed refractory with water and immediately brush the prepared sealer into the surface of the refractory lining and lid. Unless the refractory is pre-saturated with water, it will draw the moisture from the sealer, preventing a tight bonding action and the seal coating will peel. (LIGHT COATINGS APPLIED OFTEN, ARE MORE SATISFACTORY THAN ONE HEAVY APPLICATION.)

Step 5. Allow the furnace to dry for a period of at least two hours.

Step 6. Light furnace and fire slowly for about five minutes, then shut furnace down. (THIS PROVIDES HEAT TO EXPEL MOISTURE FROM THE PATCHING PLASTIC.)

Step 7. Allow the furnace to dry an additional hour, then light furnace and increase heat slowly to red heat. The furnace chamber should be inspected and cleaned of any accumulation of slag or spilled metal while the furnace is cold, prior to start up. Proper cleaning and the use of sealer should triple the life of the refractory in your furnace.

THE USE AND CARE OF FOUNDRY CRUCIBLES

COMPOSITION - TYPES OF MATERIAL:

Crucibles are manufactured in two basic compositions; the CLAY GRAPHITE-CERAMIC BONDED, AND THE SILICON CARBIDE CARBON BONDED TYPES. Both types utilize the refractory materials, graphite and silicon, as conductors of heat and for structural strength. Graphite is predominant in the composition of the clay graphite crucible, while silicon carbide predominates in the silicon carbide crucible. Due to its higher heat conductivity and greater strength, the silicon carbide crucible is more popular in industry. The less expensive clay graphite crucible is generally used in the School Shop. Crucible failure in School Shops is generally due to mishandling by inexperienced students, so the benefits of the more expensive silicon carbide crucible would not be realized.

Either type of crucible can be used for melting aluminum, brass, or gray iron. However, different metals should not be melted in the same crucible. This practice will cause contamination of each melt and it will be very difficult to get good castings. Different crucibles should be used for each type of metal melted.If gray iron is to be melted in appreciable quantity, a special clay lined silicon carbide crucible is recommended. DO NOT USE JUST ANY SIZE CRUCIBLE IN YOUR FURNACE, USE THE SIZE FOR WHICH THE FURNACE WAS DESIGNED.

RECEIVING AND STORAGE:

A great deal of stress has been put on the proper care of crucibles for maximum service life and safety. Several factors are important and should be carefully considered.

DO NOT STORE crucibles as received in their original container. Examine the container, UNPACK CRUCIBLES IMMEDIATELY, and inspect each crucible for cracks or damage. "SOUND" each crucible by tapping lightly with a hammer handle. If cracked, the crucible will have a dull sound. Undamaged crucibles will have a clear ring. If the shipment contains damaged pieces, have the delivering carrier acknowledge the damage on your delivery receipt, or notify the carrier of hidden damage and call for immediate inspection.

After inspecting crucibles, they should be STORED IN A WARM, DRY PLACE. If it is necessary to stock the crucibles in an exposed, unheated location, they should be moved to a warm area for two or three days prior to using. EXCESS MOISTURE SHOULD BE REMOVED PRIOR TO TEMPERING.

DRYING AND ANNEALING NEW CRUCIBLES:

All crucibles should be properly annealed before being put into production. Annealing relieves all strains set up in the crucible during manufacture. This also DEVELOPS A FULL ELASTIC PROPERTY TO WITHSTAND THERMAL SHOCK during service. The crucible should be dried as outlined previously, and placed in a warm furnace.

Adjust the furnace burners at idle, or lowest heat input, for the first ten minutes. Increase burner setting gradually to raise furnace temperature to a red heat. Total heating cycle should cover a period of forty to forty-five minutes. After the crucible has reached a red heat, it can be removed from the furnace, charged with metal, and put into immediate service.

CHARGING THE CRUCIBLE WITH METAL:

Crucibles are usually charged with metal before they are placed in the furnace chamber. The part of the charge consisting of gates and risers, or of clean scrap of equivalent size, is charged first. Ingots and bars are charged last. Turnings or very light scrap should be added into the crucible after the initial charge has become molten. Otherwise, the turnings and light sections will be attacked by the furnace atmosphere, and will be oxidized excessively before the melting temperature is reached. These oxides and impurities are carried into the casting metal, resulting in porous and unsound castings. Heat is transmitted to the light scrap more rapidly by the molten metal with a minimum of oxidation. ALWAYS BE POSITIVE THAT ANY METAL ADDED TO A MOLTEN BATH IS DRY, OTHERWISE AN EXPLOSION WILL OCCUR. This is because of steam generation in the molten bath. Ingots should be thoroughly dry, and added to the molten charge with long handled pick up tongs.**ADDING INGOT OR PIG TO THE CRUCIBLE:**

Heavy sections of the charge should not protrude above the lip of the crucible or they will be subjected to furnace atmosphere and excessive oxidation. THE INGOTS AND BARS SHOULD BE CUT TO A LENGTH SHORTER THAN THE INSIDE DIAMETER OF THE CRUCIBLE. This is particularly true when adding bars or pig to crucibles of molten metal. Long pieces, when added, will sink and come to rest in a horizontal position. They then expand before melting and press against the sides of the crucibles, causing cracks and premature failure.

PREHEATING CHARGE METAL:

It is very poor practice to preheat scrap or bars by placing them across the exhaust port in the lid of the furnace. Such practice causes excess oxidation of the metal and will result in poor castings. For the same reason, LONG BARS SHOULD NOT PROTRUDE THROUGH THE EXHAUST PORT INTO THE CRUCIBLE. In extreme cases, some of the bars will reach melting temperature, allowing the molten metal to run down inside the furnace lid and walls. This molten metal is oxidized very rapidly and attacks the refractory lining, causing premature replacement of the lid and lining. INGOT CAN BE PLACED AROUND THE LID, WELL AWAY FROM THE EXHAUST PORT.

MELTING CAST GRAY IRON:

If cast iron ingot material is used, we suggest that you purchase a Class 25 or a Class 30 iron. This type of cast iron melts at a slightly lower temperature and has better fluididity than the higher class irons. If new ingot is not available, good cast iron scrap can be used. One type which has good casting features is the scrap cast iron in steam radiators. The original ingot used to produce this quality of casting had to have good casting characteristics and high fluidity. Otherwise, it would not produce the thin walled, steam tight castings required in steam systems.

Cast iron motor blocks and other machinery products should not be used as scrap for remelting in a gas fired crucible type furnace. The pouring temperature of alloyed scrap iron is usually 100 - 150° higher than the Class 25 or the Class 30 Iron. The higher temperature needed to melt this alloy is very detrimental to both crucibles and the furnace linings. Pieces of steel or malleable iron scrap should not be added to the crucible charge because they also raise the melting temperature of the iron. In addition to having less desirable casting properties and being harder to pour, the finished castings may be hard and very difficult to machine.

Standard clay graphite or silicon carbide crucibles can be used for melting gray iron, however, the clay or alumina lined silicon carbide crucible is more suitable. Molten iron has an extremely high affinity for carbon, and it will leach or absorb carbon from the inner wall of the crucible during the melt. This will erode the inner surface of the crucible and shorten crucible life. The alumina or clay lined crucible has an inner lining of alumina refractory, which acts as an inert barrier between the molten iron and the carbon in the crucible. The cost of the clay lined silicon carbide crucible is slightly higher than the standard silicon carbide crucible. Availability is the problem, so ample lead time must be considered when purchasing this type of crucible.

Graphitic Carbon should be added to the cast iron scrap when the crucible is filled, prior to setting in the furnace. Certain types of Graphitic Carbon are absorbed rapidly by the molten iron, so care must be taken in selection of the correct Graphitic Carbon Raiser. Approximately three percent, by weight, of Graphitic Carbon Raiser should be added with the charge metal. A suitable material is charcoal briquets, but they do not furnish the same form of carbon. It is not as readily absorbed by the iron as is the Graphitic type of carbon raiser. Approximately six charcoal briquettes should be added to a #30 size crucible and it should be mixed with the scrap iron. This crucible will hold about 75 lbs. of iron. When charging the crucible with iron, thin sections should be added along with heavier pieces and the ingot. The thin sections will melt rapidly and form a molten puddle, which will transfer heat to the heavier sections more rapidly and reduce the over-all melting time. Additional scrap can be added to the crucible as the charge melts down. The Graphitic Carbon will generate additional heat as it burns, but more important, it will protect the molten metal from oxidation during the melt and maintain the carbon content of the cast iron.

It is imperative that both students and operators use cobalt blue goggles when melting iron, to protect their vision from the high temperature radiation. They must check the melt periodically to determine the fluidity of the melt preparatory to pouring the mold. There is usually a heavy slag formation over the surface of the melt so a rod should be used to penetrate the heavy slag to check the fluidity of the molten bath. DO NOT USE A LANCE PYROMETER WITH THERMOCOUPLE TO CHECK THE TEMPERATURE. THE MOLTEN IRON WILL MELT THE TIP OF THE LANCE.

An optical pyrometer or a replaceable thermocouple tip, lance type pyrometer should be used to check the temperature of the molten iron. The replaceable tip pyrometer is equipped with a socket type receptacle to which the thermocouple tip is attached. The thermocouple tip, when immersed in molten iron, will resist melting and destruction long enough to get a high temperature reading. A NEW TIP MUST BE USED FOR EACH TEMPERATURE READING. This equipment is quite expensive to purchase, and to maintain, except in industrial use.

After the melt has attained the proper temperature and fluidity, remove it from the furnace, then add a cast iron flux material to the crucible. This will change the plastic condition of the slag and make it easier to skim. After the molten iron has been skimmed, it is advisable to add ferro-silicon shot to replace the silicon lost during the melt. Ferro-silicon is usually wrapped in a paper envelope, and plunged beneath

Another important factor in pouring gray cast iron is to design the feeding system with larger runners, gates, and risers. The feeding system which would be used for aluminum or brass casings, will not permit a fast enough flow of molten iron into the mold cavity. The molten iron must be free to fill the mold cavity rapidly and completely. Risers will be used more frequently in iron castings than in either brass or aluminum, due to shrinkage normally found in iron solidification. We do not recommend pouring cast iron into petroleum bonded sand, due to the smoke and gas evolution. If petroleum bonded sand is used, the mold should be designed with additional venting. The smoke and gases formed when the hot metal contacts the petroleum bonded sand can then leave the mold cavity freely. It is also important to delay casting shake-out to be sure the hot casting has cooled sufficiently so the oil bonded sand does not ignite and burn.

The melting furnace should be adjusted so that the air valve is completely open, utilizing the total output of the blower. The gas valve is adjusted so there is a reducing or slightly gas-rich atmosphere in the melting chamber of the furnace. The different pouring temperatures for different classes of cast gray iron and temperatures for malleable irons and steels are as follows:

Metal	Melting Point	Pouring Temp.
Gray Iron Class 20	2150° F	2550° F
Gray Iron Class 25	2270° F	2625° F
Gray Iron Class 60	2370° F	2650° F
Malleable Iron*	2585° F	2800° F Avg.
Steel*	2700° F	2800° F Avg.

*Alloyed Gray Cast Iron, Malleable Iron, and Steel, should be melted in a Cupola or an Electric Induction or Arc Furnace.

The lower two classes of gray iron, #20 and #25, can be poured at lower temperatures, and are the most suitable for crucible melting. Cast Gray Iron alloyed with chromium or nickel, such as the grade used for gasoline engine blocks, transmission housings, etc., will have a casting temperature range which is slightly higher than the Class 60 Grey Iron. Such elevated temperatures are extremely detrimental to the furnace and crucible. These metals SHOULD NOT BE USED for crucible melting.

ACCESSORIES:

Correctly designed tongs and shanks should be used, both for safety and to minimize crucible failure. MIFCO Tongs and Shanks are designed especially for use with our furnaces.

The MIFCO Crucible Tong is designed and manufactured according to the recommendations of crucible manufacturers. Each gripper pad is die coined to uniform shape, and nests the crucible below the bilge diameter. Adjustable stops prevent excessive pressure being exerted on the crucible walls, thus avoiding crushing. All Tongs are equipped with a lifting eye and a safety bar lock.

The MIFCO Safety Shank was developed by our engineers at the request of School Shop Instructors and Educational Administrators. It is simple in design, easy to operate, and holds the crucible securely. This prevents accidental dropping and dumping a crucible of molten metal. The holding ring is die coined and formed to insure proper size and shape for secure seating of the crucible.

Automatic temperature control of our B, C, and small T series furnaces is not practical from a cost standpoint. These crucible furnaces are designed for fast melting and are fired with high input burners. Consequently, the furnace chamber develops a high thermal head that makes automatic control extremely difficult and cost prohibitive. Normal foundry practice is to use a portable lance pyrometer to check the furnace temperature periodically. When the metal approaches pouring temperature, the burners are throttled down, and the thermal head in the furnace finishes the heat. The crucible should be pulled, fluxed, and poured immediately.

the surface of the molten cast iron with a bell plunger. A stainless steel bell plunger is more satisfactory because of the high temperature. It is extremely important that the ferro-silicon is added just prior to the pour. Adding this alloy at an earlier time in the melt will retard or prevent carbon absorption. About one and one half percent, by weight, should be used for crucible melting.

As an added precaution against chill or hard spots in the gray iron casting, it is advisable to place an inoculating agent in the mold. One such agent is in the form of a small tablet called Inotab, and is made up of a compound which combines with the iron. It innoculates the iron to prevent the formation of chills and hard spots. The Inotab is placed in the sprue well of the mold prior to pouring. IT IS VITALLY IMPORTANT THAT THE MOLD BE POURED CONTINUOUSLY ONCE POURING HAS STARTED.

ULTRA VIOLET COMBUSTION SAFEGUARD WITH SPARK IGNITION

MIFCO COMBUSTION SAFEGUARD SYSTEM No. 4

SAFE STARTING:

1. Open the lid and swing away from the burner. (WARNING - DO NOT SWING THE HOT LID OVER BURNER EQUIPMENT.)
2. Open main gas line shut off cock leading to the furnace. This does not include the gas adjusting valve at the mixer.
3. Be sure both mixer gas and air adjusting valves are closed.

IGNITION:

4. Press the start button. This energizes the flame protection circuit.
5. There will be a 10 second self diagnostic period when the unit receives power. During this time, the unit checks all circuits for continuity before powering the blower.
6. After the blower starts, there is a 10 second purge cycle prior to the spark transformer and main gas coming on.
7. When the purge cycle is finished, the spark transformer and main gas solenoid will receive power. This will be indicated by the PILOT and MAIN indicator lights on the flame supervision chassis. At that time, you have 10 seconds to achieve ignition before the unit shuts down for flame failure. Open the gas adjusting valve slowly (smaller adjusting valve which enters the side of the mixer) until main burner ignites. When the flame is established and is being seen by the flame scanner, the FLAME indicator light on the chassis will be lit. The ignition trial period only lasts for 10 seconds, so burner flame must be established within this time.
8. Adjust the mixer to about 1/3 firing rate. Adjusting any two valve burner system is identical to adjusting an oxy-acetalyne torch. Increase the gas slightly until the flame shows a slight excess of gas, then open the air valve to form the flame cone at burner tunnel. IMPORTANT THE MAIN BURNER FLAME MUST BE HELD NEAR THE BURNER TUNNEL OPENING SO THE ULTRAVIOLET SCANNER CAN SEE THE FLAME.

ADJUSTING:

9. Close the furnace lid and continue opening the gas and air valves per step '8' until the air valve is wide open. There should NEVER BE MORE THAN 5 inches of flame coming out of the exhaust port at any time during adjustment of burner. See the Operating Manual for adjusting the atmosphere for melting.
10. To decrease heat, close the air valve until the exhaust flame at the exhaust port is about 5 inches long. Next, close the gas valve until the flame disappears into the furnace. Repeat the turn down sequence to the desired firing rate. Idle is about one fourth open

SHUT DOWN FOR POURING OR TEMPERATURE CHECK:

11. IDLE FURNACE PER STEP '10', then press the stop button. This closes the gas solenoid shut off valve and stops the blower. DO NOT CHANGE IDLE ADJUSTMENT OF VALVES. To restart the furnace, press the start button and the furnace will re-ignite at the idle position.

SHUT DOWN TO SECURE FURNACE AT END OF MELTING PERIOD:

12. Press the stop button. Close both of the mixer adjusting valves. Close the gas line shut off cock. Close the furnace cover.

RE-IGNITION AFTER FLAME FAILURE:

a. Turn off all burner adjusting valves.
b. Press the stop button on the start-stop station.
c. Wait 50 to 60 seconds for safety timers to cool off.
d. Depress the RESET button on the flame supervision chassis.
e. Open the furnace cover. Repeat ignition steps 4 through 8.

TROUBLE SHOOTING FOR INITIAL START-UP:

A. FURNACE WILL NOT RESTART AFTER MELTING CYCLE AND SHUTDOWN: The gas valve was closed, extinguishing the flame before the stop button was pressed. This simulates a flame failure and initiates the flame failure shutdown cycle. Follow the steps in RE-IGNITION AFTER FLAME FAILURE, to restart the furnace.

B. FURNACE IGNITES SATISFACTORILY, BUT SHUTS DOWN WHEN HEATING RATE IS INCREASED: Too much gas in the mixture. The flame blows away from the burner tunnel, simulating a flame failure. Refer to the information in STEP 8 of IGNITION.

C. FURNACE SHUTS DOWN WHEN FURNACE IS ADJUSTED TO MAXIMUM FIRING: Insufficient gas supply. The excess air extinguished the flame. Have a gas utility company check the gas regulator and size of installation against the BTU rating of furnace.

D. SLOW MELTING: Insufficient gas supply. The operator should be able to open the air valve all the way and still have excess gas available. See the Operating Manual on: OPERATION.

E. FURNACE WILL NOT START AFTER FLAME FAILURE SHUTDOWN: The flame relay has not been reset. See STEP "d" in RE-IGNITION. Insufficient waiting period for cool down of timers. See STEP "c" RE-IGNITION.

SERVICING - TROUBLE SHOOTING:

Problems with MIFCO furnaces with Fireye Controls can be easily isolated by following the approved procedure in the sequence given below. Before starting any trouble shooting, however, make sure of the following:

1. Installation and wiring has been made in accordance with the manufacturer's instructions.
2. The Fireye Chassis is securely plugged in and the top and bottom retaining screws are tightened. The Lockout Switch (red pushbutton) is reset.

In the following list, problems are listed first, and the possible causes are listed below in numerical order. Refer to the manufacturer's instruction manual included in this operating manual for proper component and contact identification. It is necessary to have a 20,000 ohm, DC volt meter to perform signal testing. This meter, set on 150 volt AC scale, may be used to check line and load voltages at the identified terminal studs on the components.

A. FURNACE WILL NOT START:

1. No voltage at start button or at UV terminals S1 and S2:
    a. Power cord not plugged into outlet.
    b. No power at outlet, (check with meter).
    c. Disconnect switch is off that feeds outlet.

A. FURNACE WILL NOT START: - (cont.)

d. Broken wire between outlet and control box.
e. Blown fuse that feeds circuit breaker.
f. Check the 2 amp control fuse.

2. Insufficient voltage at UV terminals S1 and S2:
   a. Minimum voltage is 102 volt - 50/60 cycle.
   b. Maximum voltage is 132 volt - 50/60 cycle.

3. No voltage to coil of motor starting relay R-1:
   a. With volt-meter, check wires to relay coil from start / stop buttons.

4. Unit not properly grounded.

B. MOTOR STARTING AND HOLDING RELAY WILL NOT OPERATE:

1. No action when start button is activated:
   a. Check for voltage on either side of start button. If there is no voltage, replace the bad switch.
   b. Check relay coil, gray wire, for voltage.

C. HOLDING RELAY WORKS BUT MOTOR DOES NOT RUN:

1. Check motor overload:
   a. Check with voltmeter to see if power is passing through to motor. Check from ground to overload.
   b. Push the reset button on the motor overload.
   c. Check the heater element on the top of the motor overload to see if it is burnt in half.
   d. Examine relay contacts.

D. THE MOTOR RUNS, BUT THE SPARK DOES NOT COME ON:

1. Check the spark plug for power:
   a. Remove the spark plug cap. Hold this cap by the outside corner and hold the cap up to a metal part of the furnace and push the start button to see if there is a spark at the cap.

2. Check the air pressure switch:
   a. Remove the junction box cover on the top of the air pressure switch (004226). Place both wires inside on the same terminal, this will by-pass the switch. If you get a spark when you press the start button, you know the switch is bad.
   b. With the air switch by-passed and the motor running, check UV terminals 2 & 4 for line voltage, 120V. If no voltage is present, replace UV chassis.

3. Check the spark plug:
   a. Pull off the spark wire and hold by the outside corner of the connector cap. Hold the metal part of the cap close to the burner and press the start button. If it sparks, the transformer is OK. If not, check the spark wire connections on both ends and try again. If there is still no spark and there is 120 volts-on terminals 2 & 4, then you should replace the spark transformer.

4. The spark plug does not fire:
   a. Remove the plug and look for cracks in the porcelain insulator. If it is cracked, replace with the same electrode.

4. (cont.)
   b. If the plug is not cracked, install it back in the furnace. The gap between the wire tip of the plug and the end of the burner nozzle should be 1/16" to 1/8". This can be adjusted by bending the electrode wire, swiveling the electrode, and then tightening the clamping nut to hold it in place. Observation can be made with a mirror inside the furnace or through the UV Scanner observation port. In either case, **BE SURE THE GAS IS OFF**.

E. THE MOTOR RUNS, THERE IS A SPARK, BUT NO GAS:

1. Scanner does not see spark:
   a. Remove the scanner to see if the sight tube is blocked.
   b. Wipe off scanner bulb with soft cloth or tissue and replace.

2. Broken Scanner wire:
   a. Check for cuts or mashed conduit.

3. Ignition signal testing using a 20,000 ohm per volt DC volt meter:
   a. Connect the meter to terminals S1 & S2.
   b. Set the volt meter on the 10 volt DC scale and initiate a normal start up, but with the gas valve CLOSED. The meter should read between 41/2 and 5 volts. If the-meter goes backwards, reverse the leads. If the reading is less than 41/2 volts, the scanner needs to be replaced.

F. GAS SOLENOID WILL NOT OPEN:

1. After checking all of the above, check terminals 2 & 3 on UV Chassis for line voltage:
   a. Put the volt meter back on the AC-250 volt scale and put the leads on terminals 2 & 3. Start the furnace, and when the unit goes to Main Flame, terminal 3 should be energized, reading 120 volts. If it is not, and every thing else proves out, the chances are that the UV Chassis is bad and needs replacing.

2. Terminal 3 is powered but the solenoid still will not open:
   a. Check for broken wires or loose connections.
   b. The solenoid wires can be taken loose by a qualified electrician and powered with 120 volts to see if it will open. If it does not open, it will have to be replaced.
   c. Check to see that the gas pressure is not higher than the rating on the valve nameplate.

G. MAIN FLAME SIGNAL TESTING:

1. Same procedure as STEP "E" - "3".

H. MAIN FLAME DOES NOT LIGHT:

1. Gas valve shutoff someplace in building.

I. MAIN FLAME LIGHTS AND GOES OUT AFTER 10 SECONDS:

1. Flame not adjusted properly:
   a. It is best to get the furnace flame at least half way open before the spark goes off, especially on a cold start up.

J. FURNACE SHUTS DOWN WHEN IT IS ADJUSTED TO MAXIMUM FIRE:

1. Insufficient gas supply:
   a. Excess of air extinguishes the flame. Have the gas utility company check the gas pressure with the furnace running. If the pressure drops to "0", the gas supply is inadequate.
   b. Not enough gas in adjustment, the flame should come out of the exhaust port about 3 inches.

2. Too much gas:
   a. The flame is burning away from the burner port. The UV Scanner cannot see flame and turns off gas.

K. SLOW MELTING:

1. Insufficient gas supply:
   a. The operator should be able to open the air valve all the way and still have an excess of gas after the flame has been balanced.

2. Low service line voltage:
   a. The voltage on the service line should be 115 volts. Low voltage causes the rpm of the motor to drop, which results in a reduced volume of air.
   b. Bad bearings will also slow down a motor.

L. FURNACE WILL NOT RESTART AFTER STOPPING:

1. Gas valve was shut off before stop button was pressed:
   a. The reset has kicked out. Push the Reset Button on the UV Chassis and then restart.

2. UV Chassis may be going out.

3. Gas supply marginal and / or fluctuates:
   a. When starting with the valves in a set position and the gas supply or pressure changes, like when a boiler comes on, the valve setting would not be right and the unit would not start.

M. FURNACE WILL NOT START AFTER FLAME FAILURE:

1. Not enough time has elapsed for blower to stop spinning and allow the air switch to reset:
   a. Allow blower to stop spinning then press reset button on UV Chassis.

2. Bad UV Chassis.

3. Bad UV Scanner.
   a. Check and replace if necessary.

N. ELECTRICAL SEQUENCE:

1. Press the start button and the system performs- self check.
2. Holding coil pulls in and motor starts.
3. Air switch closes powering terminal 6 in UV Chassis.
4. Terminals 4 and 3 powered. Ignition transformer powered and ignition timing starts. Main gas solenoid powered.

N. ELECTRICAL SEQUENCE - (cont.):

5. Gas in scanner ionized, allowing power to flow between electrodes.
6. Main flame is proven and stays on.
7. Flame failure for any reason cuts off power to terminal 4 and 3 in 3 seconds.
8. Alarm light comes on.
9. Push reset button.
10. Blower failure, air switch opens - cutting power to gas solenoid. Blower runs another 10 seconds and turns off.

PREVENTIVE MAINTENANCE
For Models T-160, T-301

Electrical System

Always check start stop buttons, to make sure they remain tight in the control box. Loose buttons can cause the wire connectors inside to pull away from the buttons, thus causing a short or other failures.

Make sure that the UV cover is always in position. If the cover were missing, this would allow for the bumping of the spark wire and possible disconnection of the wire, and also damage to the scanner cable.

Make monthly checks of the spark wire to make sure that the angle connector is tight on the wire, and also pushed up tight on the electrode. At the same time, remove the scanner from the swaged nipple and clean the glass globe with a clean cloth.

Lid & Lid Lift Assembly

The jack tube assembly should be greased at least once a month. This will allow for the easy rotation of the assembly. Make sure that when the lid is raised, that it raises level. After a period of time, the lid will have a tendency to raise in the back before it raises in the front. If the lid isn't raising level, loosen the lock nuts on the lifting rods and back them off a couple of turns, then tighten the bottom nuts which will raise the lid up. Continue to tighten the nuts until the lid raises properly. Always remember to remove the lid handle from the fulcrum rod after the furnace has ignited and the lid is closed. If the handle is left in that position, it will become very hot. Place the handle in the brackets provided on the side of the stand.

Shell Assembly

Make it a practice to always check the furnace for what we call hot spots. Be mainly concerned with the area around the burner guide tubes. You will notice a discoloration of the paint in this area, but only be alarmed if you should see a red glow to the shell. This may indicate that the end has burned off the burner nozzle, allowing the flame to direct itself back into the insulation, thus causing damage to the shell. If you should notice this, shut the furnace down at once. The next step would be to disconnect the union holding the manifold pipe into the burner port, allowing you to pull the manifold pipe away from the shell. If you see that the burner nozzle is very burnt, it is time to replace. It would be advisable to keep a nozzle in stock at all times. Place the manifold pipe in a vise, and remove the nozzle with a pipe wrench, and screw the new nozzle in position and reinstall in the same manner that you disassembled. Do not forget to reconnect your scanner and spark cables.

FIRING CHAMBER

Make regular checks for cracks in the liner bricks, and also for loose mortar between the rows of brick. If there are open gaps between the brick, the flame can penetrate and erode the insulation, thus causing hot spots on the side of your furnace shell.

At least once a month, take a putty knife and scrape the loose refractory, allowing it to fall to the bottom of the chamber, then remove with a vacuum. After the removal of all the loose materials, find an old paint brush or sponge and a can of water. Apply a liberal coat of water on your bricks to allow your new application of sealer to adhere to the bricks. **Please keep in mind that thin applications of sealer are better than one heavy coat.** A thick coat of sealer will flake off and fall to the bottom of the chamber. It is best to fill all large openings with thick material, then thin your sealer down and apply at least three very thin coats with a low firing between each application.

It is advisable to make sure that the drain hole in the bottom of the furnace is always open and not blocked with hardened metal slag. This is an escape route for the metal in case of a crucible break. Do not allow metal to accumulate in the pour spout area, keep clean at all times.

Gear Box Assembly

The gear box assembly is on the side of the furnace, with your hand crank facing upward from the box. If you should find oil dripping on the floor, this is a sign that the gasket between the two halves of the box needs to be replaced. Refer to your owner's manual for the correct part number and contact your local distributor for the replacement parts. Allowing your gear box to become free of oil, will result in excessive and premature wear to the gears and the bearings. Be sure that all gears are covered with oil at all times. You can purchase gear lube at your local farm store.

Electrical System

Always check start stop buttons, to make sure they remain tight in the control box. Loose buttons can cause the wire connectors inside to pull away form the buttons, thus causing a short or other failures.

Make sure that the UV cover is always in position. If the cover were missing, this would allow for the bumping of the spark wire and possible disconnection of the wire, and also damage to the scanner cable.

Make monthly checks of the spark wire to make sure that the angle connector is tight on the wire, and also pushed up tight on the electrode. At the same time, remove the scanner from the swaged nipple and clean the glass globe with a clean cloth.

Lid & Lid Lift Assembly

The jack tube assembly should be greased at least once a month. This will allow for easy rotation of the assembly. Make sure that when the lid is raised, that it raises level. After a period of time, the lid will have a tendency to raise in the back before it raises in the front. If the lid isn't raising level, simply loosen the lock nuts on the lifting rods and back them off a couple of turns, then tighten the bottom nuts which will raise the lid up. Continue to tighten the nuts until the lid raises properly. Always remember to remove the lid handle from the fulcrum rod after the furnace has ignited and the lid is closed. If the handle is left in that position, it will become very hot. Place the handle in the brackets provided on the side of the stand.

When greasing the lid assembly, also grease the bearings at the swivel points on the front of the stand. Those bearings should not be allowed to dry out.

Shell Assembly

Make it a practice to always check the furnace for what we call hot spots. Be mainly concerned with the area around the burner guide tube. You will notice discoloration of the paint in this area, but only be alarmed if you should see a red glow to the shell. This may indicate that the end has burned off the burner nozzle, allowing the flame to direct itself back into the insulation and thus causing damage to the shell. If you should notice this, shut the furnace down at once. Your first step would be to loosen the union on the manifold pipe and pull it away from the furnace body. If you should find that the end of the nozzle has been burnt away, order a new one and replace it immediately.

Firing Chamber

Make regular checks for cracks in the liner bricks, and also for loose mortar between the rows of brick. If there are open gaps between the brick, the flame can penetrate and erode the insulation, thus causing hot spots on the side of your furnace shell.

At least once a month, take a putty knife and scrape the loose refractory, allowing it to fall to the bottom of the chamber. Then remove with a vacuum. After the removal of all loose materials, find an old paint brush and a can of water. Brush a liberal coat of water on your bricks to allow your new application of sealer to adhere to the bricks. **Thin applications of sealer are better than one heavy coat,** a thick coat sealer will flake off and fall to the bottom of the chamber. It is best to fill all large openings with thick material, then thin your sealer down and apply at least three very thin coats with a low firing between each application.

Firing Chamber - cont.

When firing your T-80 furnace, always make sure that the drain plug brick is in position in the front of the furnace. If this brick is not in its proper place, the flame will exit through the hole, thus causing the insulation behind the inner liner to deteriorate. Be sure the brick is easily removable, to allow the liquid metal to flow out into an ingot mold or pan, should a crucible break.

Gear Box Assembly

The gear box assembly is on the side of the furnace. If you should find oil dripping onto the floor, this is a sign that the gasket between the to halves of the box needs to be replaced. Refer to your owner's manual for the correct part number and contact your local distributor for the replacement. Allowing your gear box to become free of oil, will result in excessive and premature wear to the gears and bearings. If your unit is motorized, please make sure that the guard is in position at all times. Make frequent checks of the drive belt, checking for cracks. If cracks are found, replace at once. Inspect the rubber boot seals around the limit switches and replace if cracked.

Preventive Maintenance
For Model T-200 Tilting Furnace

Electrical System

Always check start stop buttons, to make sure they remain tight in the control box. Loose buttons can cause the wire connectors inside to pull away from the buttons, thus causing a short or other failures.

Make sure that the UV cover is always in position. If the cover were missing this could allow for bumping of the spark wire and possible disconnection of the wire, and also damage to the scanner cable.

Make monthly checks of the spark wire to make sure that the angle connector is tight on the wire, and also pushed up tight on the electrode. At the same time, remove the scanner from the swaged nipple and clean the glass globe with a clean cloth.

It is also a good idea to make frequent checks of the flexible conduit cables going to the hydraulic pump motor, to make sure that the cables are not loose from their connectors and falling down and exposing the inner wires.

Lid & Lid Lift Assembly

The jack tube assembly should be greased at least once a month. This will allow for the easy rotation of the assembly. Make sure that when the lid is raised, that it raises level. After a period of time, the lid will have a tendency to raise in the back before it raises in the front. If the lid isn't raising level, simply loosen the lock nuts on the lifting rods and back them off just a couple turns, then tighten the bottom nuts which will raise the lid up. Continue to tighten the nuts until the lid raises properly. Always remember to remove the lid handle from the fulcrum rod after the furnace has ignited and the lid is closed. On this specific unit, always make sure that the lid is bolted to the lid stop, to prevent lid from shifting when tilted. Place the lid handle in the brackets on the stand. This way you will always be able to find the handle.

Furnace Shell & Stand Assembly

Make it a practice to always check the furnace for what we call hot spots. Be mainly concerned with the area around the burner guide tube. You will notice discoloration of the paint in this area, but only be alarmed if you should see a red glow to the shell. This may indicate that the end has burned off the burner nozzle, allowing the flame to direct itself back into the insulation and thus causing damage to the shell. If you should notice this, shut the furnace down at once. Your first step would be to loosen the union on the manifold pipe and pull it away from the furnace body. Since this is a four burner furnace, you will be pulling away two burner ports at one time. If you should find the ends of the burner nozzles are burnt away, this is the time to replace all of the nozzles. It would be advisable to keep a set of four on the shelf for future use.

Another item to check frequently is the spring pin, located on the 1" round pin that goes through the clevis on our cylinders. If this pin is missing , there is a very good possibility that the pin could back its self out of the clevis with continuous lifting, and be the cause of the furnace body falling down, when lifting upward.

It is good practice to make sure that the bearings on the stand are greased at the swivel point. These bearings sustain a lot of pressure when the furnace is up in the air. Never let the bearings become dry, as it would be a major operation to have to change those bearings.

Firing Chamber

Make regular checks for cracks in the liner bricks, and also for loose mortar between the rows of brick. If there are open gaps between the brick, the flame can penetrate and erode the insulation, thus causing hot spots on the side of your furnace shell. At least once a month, take a putty knife and scrape the loose refractory, allowing it to fall to the bottom of the chamber. Then remove with a vacuum. After the removal of the loose materials, find an old paint brush and a can of water, and brush a liberal coat of water on your bricks to allow your new application of sealer to adhere to the bricks. **Keep in mind that thin applications of sealer is better than one heavy coat,** a thick coat of sealer will flake off and fall to the bottom of the chamber, as soon as the furnace is fired. It is best to fill all large openings with thick material, then thin your sealer down and apply at least three very thin coats with a low firing between each application.

When firing your furnace, always make sure that the drain plug brick is in position in the front of the furnace. If this brick is not in its proper place, the flame will exit through the hole, thus causing the insulation behind the inner liner to deteriorate. Check frequently to see that the brick is loose, and can be removed without a problem. This is your escape route for liquid metal in case a crucible should break.

Another area to watch is the bottom of the chamber, where we have the indentation for the base block. Do not allow liquid metal to build up in this area, as it will not allow the base block to remain within the indentation. The purpose of this indentation is to help hold the base block in place when the furnace is tilted. If this area is full of hardened metal the base block will seat above the metal and possibly slide forward when the furnace is tilted, and block the drain hole.

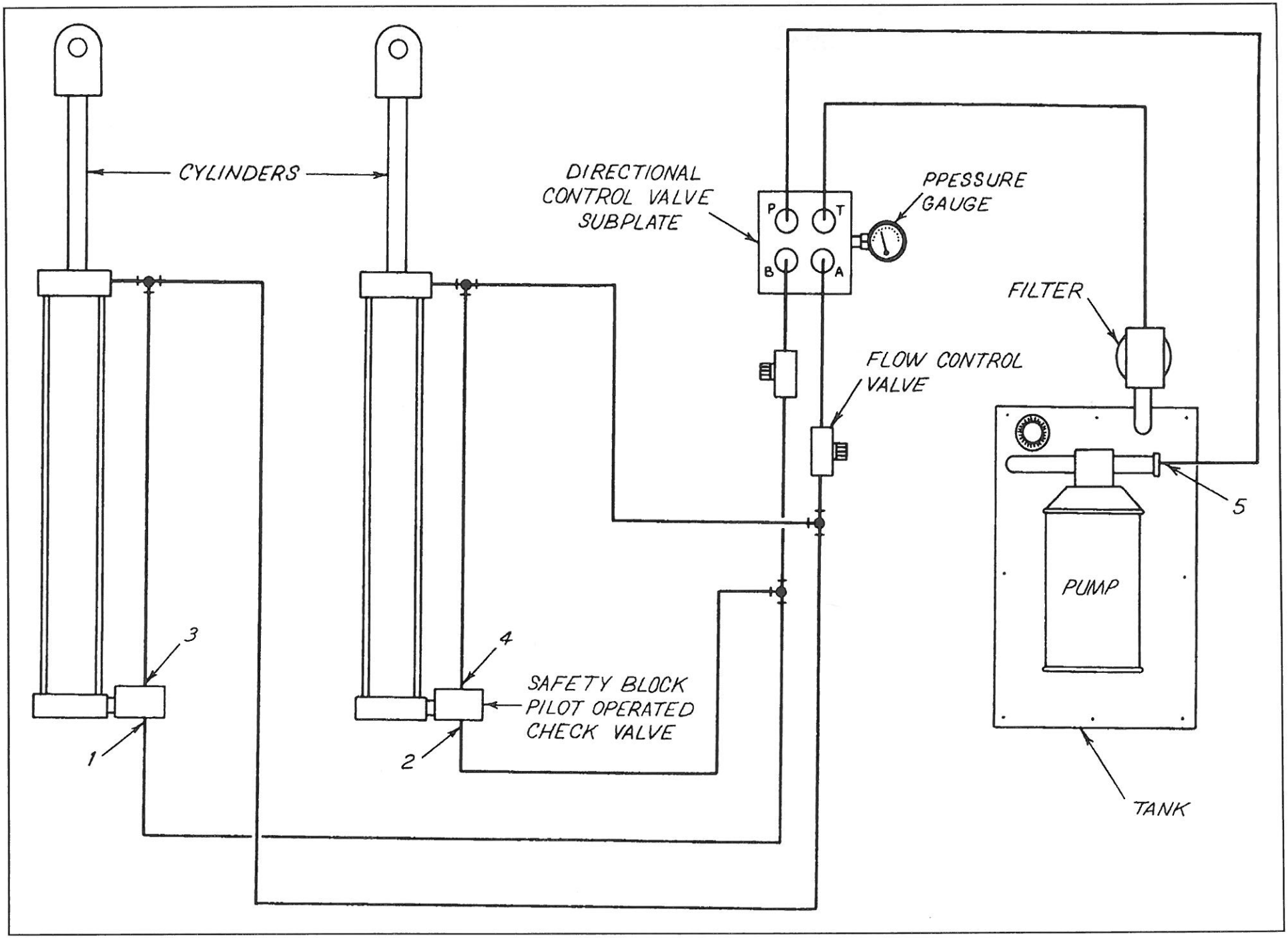
We suggest that you keep close watch on the length of your crucible support bricks, as with continuous use, the bricks will wear. We want the crucible to remain as close to the center of the chamber as possible. This will allow for even flame flow all around the crucible. We advise you to have a spare set of crucible support bricks, as well as a drain plug in stock at all times. If the crucible is allowed to fall close to the front wall of the furnace when tilted upward, this will block the continuous flame flow around the crucible.

We feel that by following these simple suggestions that this will add years of life to your unit. Continued maintenance is the key to a longer operational life of the furnace.

Hydraulic Cylinders, Hoses & Filters

Make it a practice to frequently check the floor area around your hydraulic hoses. It you notice oil on the floor, this usually means that there is a pin hole leak in a hose, or there could be oil leaking from the fittings. Also watch for ballooned areas in your hoses, that means there is a weak spot in the hose that will blow out sooner or later. If you see such an area, we advise you to change the hose as soon as possible prior to it blowing out. The hoses will develop weak areas over a period of time. Be aware of oil on the floor in the area of your oil filters. This usually means that your canister seal has gone bad. We suggest that you keep at least one of each of your oil filters on your shelf at all times. Delivery on those spare parts at times can be very lengthy. Watch for oil leaking from your hydraulic cylinders, this usually means that there is a problem with O rings within the cylinder. Those items can be replaced by following simple instructions that come with the replacement rings.

We feel that by following these few simple suggestions that you add years of life to your T-200 melter. Continued maintenance is the key to a longer operational life of the furnace.


CYLINDERS
DIRECTIONAL CONTROL VALVE SUBPLATE
P
T
B
A
PPESSURE GAUGE
FILTER
FLOW CONTROL VALVE
5
PUMP
TANK
3
4
SAFETY BLOCK
PILOT OPERATED
CHECK VALVE
1
2

CITGO FR WG-40XD® HYDRAULIC FLUID

Date 09/13 - (Continued)

TYPICAL PROPERTIES:

CITGO FR WG-40XD® HYDRAULIC FLUID	
Material Code	648326001
Specific Gravity, ASTM D 129, at 60/60°F	1.0817
Density, lb/gal	9.018
Flash Point, COC, ASTM D 92, °F (°C)	None
Viscosity, D 2161, SUS at 100°F	200
Viscosity Index, ASTM D 2270	180
Pour Point, ASTM D 97, °F (°C)	-40 (-40)
Color	Pink
pH	9.5
Reserve Alkalinity, ASTM D 1121(1)	19.0
Four Ball Wear Test, ASTM D 4172, 40 Kg load, Scar Dia., mm(2)	0.66
Foam Inhibitor	Yes

Notes: (1) Milliliters of 0.1N hydrochloric acid solution required to neutralize 10 milliliters of fluid to a pH of 5.5.
(2) Test conditions: 1 hour, 130°F, 1800 rpm.

CITGO FR WG-40XD® HYDRAULIC FLUID

Date 09/13

DESCRIPTION: CITGO FR WG-40XD Hydraulic Fluid is a premium water-glycol type fire-resistant fluid designed to provide optimum performance in hydraulic systems requiring fire resistance such as those found in steel industry operations.

QUALITIES: CITGO FR WG-40XD Hydraulic Fluid is specially formulated to provide excellent service over a wide range of operating conditions. It is particularly effective in demanding steel industry applications.

CITGO FR WG-40XD is formulated to provide the following benefits:

- Factory Mutual approved
- Excellent fire resistance, no flash or fire point
- Meets U.S. Steel Requirement No.171
- Meets ASTM D2882 Sperry-Vickers V104C pump test
- Enhanced lubricity, with wear, foam and corrosion protection
- Excellent heat transfer

APPLICATIONS: CITGO FR WG-40XD Hydraulic Fluid may be used in most types of hydraulic systems requiring fire resistance. Applications include steel mills, die casting and power transmission plants. CITGO FR WG-40XD is recommended in fire resistant hydraulic systems operating with Eaton/Vickers, Parker/ Denison, Rexroth and other vane and piston pumps.

Maintenance of viscosity of CITGO FR WG-40XD is recommended as follows:

CITGO FR WG-40XD WATER ADJUSTMENT CHART

BRIX	VISCOSITY (SUS) AT 100°F	VISCOSITY (cSt) AT 40°C	PERCENT WATER IN UNADJUSTED FLUID	GALLONS OF WATER NEEDED PER 100 GALLONS OF UNADJUSTED FLUID IN SYSTEM	CONDITION
50.0	412	82.5	28.4	18.1	SEVERE LEVEL
49.5	394	78.8	29.3	17.1	
49.0	377	75.0	30.2	15.8	
48.5	358	71.2	31.2	14.4	
48.0	342	67.9	32.2	13.0	
47.5	324	64.3	33.3	11.5	
47.0	309	61.3	34.2	10.2	
46.5	294	58.4	35.3	8.8	MODERATE LEVEL
46.0	280	55.6	36.5	7.3	
45.5	266	52.7	37.7	5.8	
45.0	253	50.1	38.8	4.5	
44.5	241	47.7	40.0	3.0	
44.0	228	45.0	41.5	1.5	NORMAL
43.5	217	43.0	42.7	0.0	
43.0	207	41.0	43.9	0.0	
42.5	197	38.9	44.5	0.0	
42.0	187	37.0	45.5	0.0	
41.5	177	34.5	-	Excess Water	
40.0	153	30.0	-	Excess Water	

(Continued)

RETURN LINE FILTER

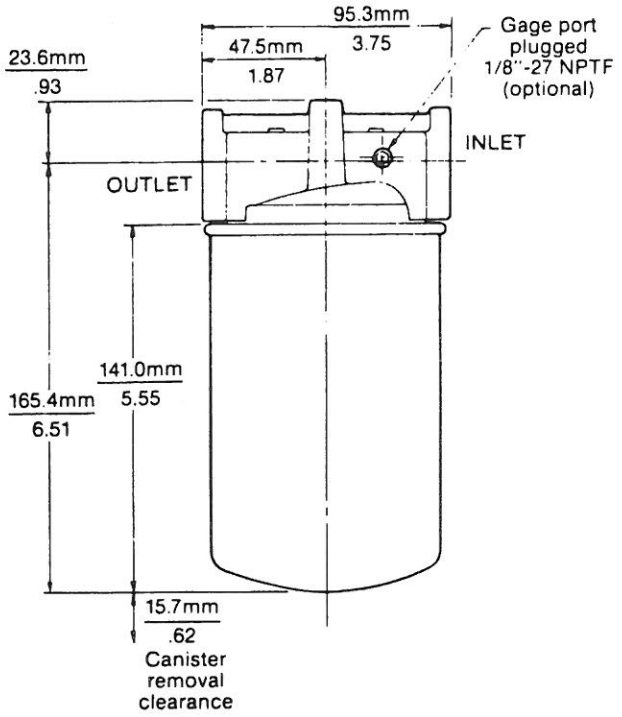
Maintenance.

Frequency:
Use of an indicator gage allows maximum life from your Parker Spin-On Canister. When checked regularly, gage tells operator when to schedule maintenance of filter.

If a gage is not used, replace filter canister after first 100 hours of service, and every 500 hours thereafter. More frequent replacement may be required, depending on the amount of dirt entering the system and flow rate. If canisters are in service too long, system components may be damaged.

Methods:
When replacing a Spin-On Canister:

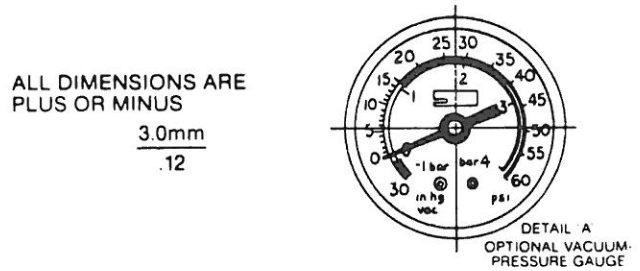
1. Turn off system; let pressure drop to zero.
2. Remove canister by hand or with a strap wrench.
3. Apply a film of system oil to outer gasket seal of new canister before installation.
4. Install new canister by twisting on hand tight.

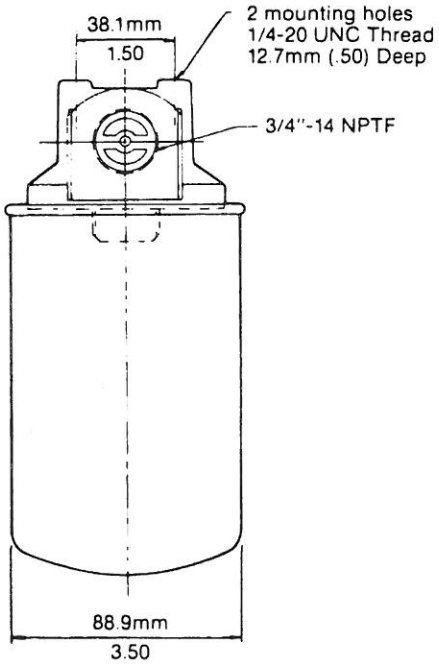


*Specifications.

Flow Capacity	76 lpm (20 GPM)
Maximum Working Pressure	10 bar (150 psi)
Operating Temperatures	-40° C (-40° F) to +149° C (300° F)
Weights (approx.)	
Complete Filter	1.02 kg (2.25 lbs.)
Canister Only	0.50 kg (1.1 lb.)
Filtration Rating	10 Micron, Nominal (Beta (10) = 2.5)
Media	Phenolic Impregnated Cellulose
Seals (Inner and Outer)	Buna N, 70 DUR.
Gage (Optional) Detail A	Compound Type, -30" Hg/0/60 psi

***Complete 12-AT Filter, or 12-AT Replacement Canister used on Parker Filter head.**





IN TANK PICK UP FILTER

TECHNICAL DATA:

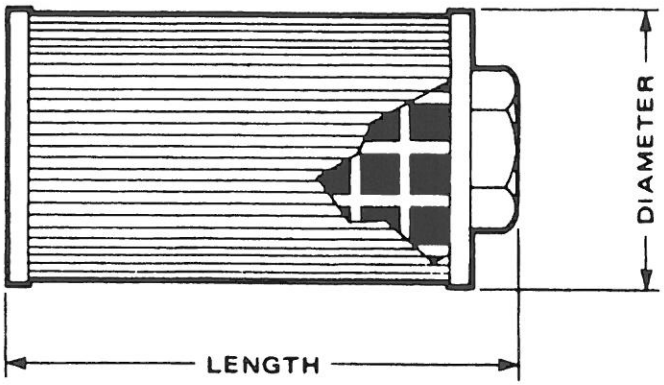
SCREEN – The recently developed low cost screen is compatible with all known hydraulic oils in use today. The screen base is a nylon mesh welded at each cross-over section to maintain a uniform pore size. A silver coat is applied to the mesh to allow a coat of nickel to be applied, thus equalling the performance of a stainless steel.

MESH – The metal coat gives the nylon screen rigidity and is self-supporting.

NUT – Is produced from a high-strength, glass-filled nylon.

END CAP – Is aluminum, except when a bypass valve is included where the material is changed to steel for added strength.

BONDING – Continuous epoxy for compatibility with all fluids.



MODEL NUMBER DATA

CF – SE – 5 – 3

- CF: Can Flo Identity
- SE: Suction Element Basic Series
- 5: GPM Rating — 3 50, 5 75, 10 100, 20 150, 30
- 3: Bypass Omit if Not Required

FILTER MODEL (BASIC)	PORT SIZE A	FLOW RATE		SCREEN AREA		DIAMETER		LENGTH		WEIGHT	
		GPM	LPM	SQ. INS.	SQ. CMS.	INS.	MM	INS.	MM	LB	KG
CFSE-3	½" NPT	3	11.4	40	258	2.75	70	3.0	76	.25	0.11
CFSE-5	¾" NPT	5	19	60	387	2.75	70	5.0	127	.30	0.14
CFSE-10	1" NPT	10	38	125	806	2.75	70	6.5	165	.40	0.18
CFSE-20	1¼" NPT	20	76	160	1032	3.90	99	6.5	165	.50	0.23
CFSE-30	1½" NPT	30	114	300	1935	3.90	99	8.5	216	.65	0.30
CFSE-50	2" NPT	50	190	350	2258	3.90	99	10.0	254	.80	0.36
CFSE-75	2½" NPT	75	285	400	2581	5.35	136	12.48	317	1.00	0.45
CFSE-100	3" NPT	100	380	500	3226	5.35	136	13.0	330	1.25	0.57
CFSE-150	3" NPT	150	570	700	4516	5.35	136	15.0	381	1.50	0.68

Flow rates are based upon pressure drops across the element of less than 0.25 PSI (0.017 Bar.) with a fluid viscosity of 150 SSU (28 centistokes) clean element.

TROUBLE SHOOTING HYDRAULIC SYSTEM

PUMP MOTOR DOES NOT RUN:

1. Check the incoming power.
2. Check power through the motor overload.
3. Check the start-switches.
4. Check out motor and electrical connections.

MOTOR RUNS BUT NO PRESSURE ON HYDRAULIC GAUGE:

1. Check motor rotation. Looking at the pump from the return line oil filter end of the pump the rotation would be counter clockwise.
2. Check the oil level in the reservoir.
3. Check the valve pressure adjustment.
4. Check the pressure gauge, it may be defective.

MOTOR RUNS AND PRESSURE SHOWING ON OIL PRESSURE GAUGE BUT CYLINDERS WILL NOT MOVE:

1. Check flow control valves, they may have been shut off.
2. Inadequate pressure to pilot check valves.
3. Directional valve may not be operating properly. Watch the hoses to see if they move when the valve is operated.
4. Pressure too low, check gauge, should be 900 lbs.
5. Cylinders leaking by the pistons. Pressurize one side of the cylinder and **disconnect** the hose from the other side. Observe leakage, there should not be more than 2 cubic inches per minute.
6. Check oil pressure gauge, may not be working.

FURNACE IN UP POSITION AND WILL NOT COME DOWN:

1. Not enough pressure getting to pilot operated check valves. Valve or lines may be clogged or need cleaning.
2. Pilot operated check valves may be sticking.
3. Pilot operated check valves may need cleaning or replacing.

FURNACE UP AND SLOWLY GOES DOWN WHEN OPERATOR VALVE IS IN NEUTRAL POSITION:

1. Pilot operated check valve adjusting screw needs to be screwed in slightly.
2. Oil is leaking by the piston seals and they will have to be replaced.
3. In either of the above it will be one side of the furnace or the other and should **be obvious** as to which side is going down.

FURNACE SLOWLY TILTS WITHOUT OPERATING DIRECTIONAL CONTROL VALVE:

1. Check for leaks through the operating valve.

CYLINDER BODY SEAL LEAK:

1. Loose tie rods, tighten evenly
2. Excessive pressure, reduce to recommended pressure.
3. Seal deteriorated, gumming and soft, should be replaced. Check seal material compatibility with cylinder oil.

ROD AND SEAL LEAK:

1. Torn or worn seal. Examine the piston rod for dents, gauges or score marks. Replace the rod if the piston rod is rough.
2. Seal deterioration, soft or gummy. Replace seal and check seal compatibility with cylinder oil.
3. Check the rod gland bearing, if loose they may cause premature seal deterioration. Replace both the gland bearing and seal.
4. Seal deterioration, hard or loss of elasticity, usually due to heat exposure. Replace and shield from heat.

TROUBLE SHOOTING PUMPS

PUMP MAKES EXCESSIVE NOISE:

1. Check for leaks in the suction line
2. Check for leaks in the pump shaft seal.
3. Check the pump adaptor bolts holding the pump to the motor, they may be loose.
4. The relief or unloading valve may be set too high. Check the gauge to see if it is reading correct. The valve may have heen set too high because of a faulty guage.
5. Air in fluid lines. The oil level may be too low and are sucking in air at times.
6. Worn or sticking vanes, in vane type pump.
7. Worn or faulty bearing.
8. Reverse rotation on pump shaft.
9. Plugged or restricted suction line or suction strainer.
10. Plugged filter breather in the reservoir.
11. Loose or worn pump parts.
12. Suction filter too small.

PUMP FAILS TO DELIVER FLUID:

1. Low Fluid level in resevoir.
2. Oil intake strainer plugged.
3. Air leak in suction line preventing priming.
4. Pump shaft turning too slow. The universal joint may have come loose or defective.
5. The pump motor may be going bad or single phasing because of hlown fuse or broken wire.
6. Wrong shaft rotation.
7. The pump shaft broken or some other part in pump broken.
8. There may be dirt in the oil pump.

OIL LEAKAGE AROUND PUMP:

1. The shaft seal may be worn.
2. The pump housing bolts may be loose.
3. The hoses or pipes may be leaking around the pump.

EXCESSIVE PUMP WEAR:

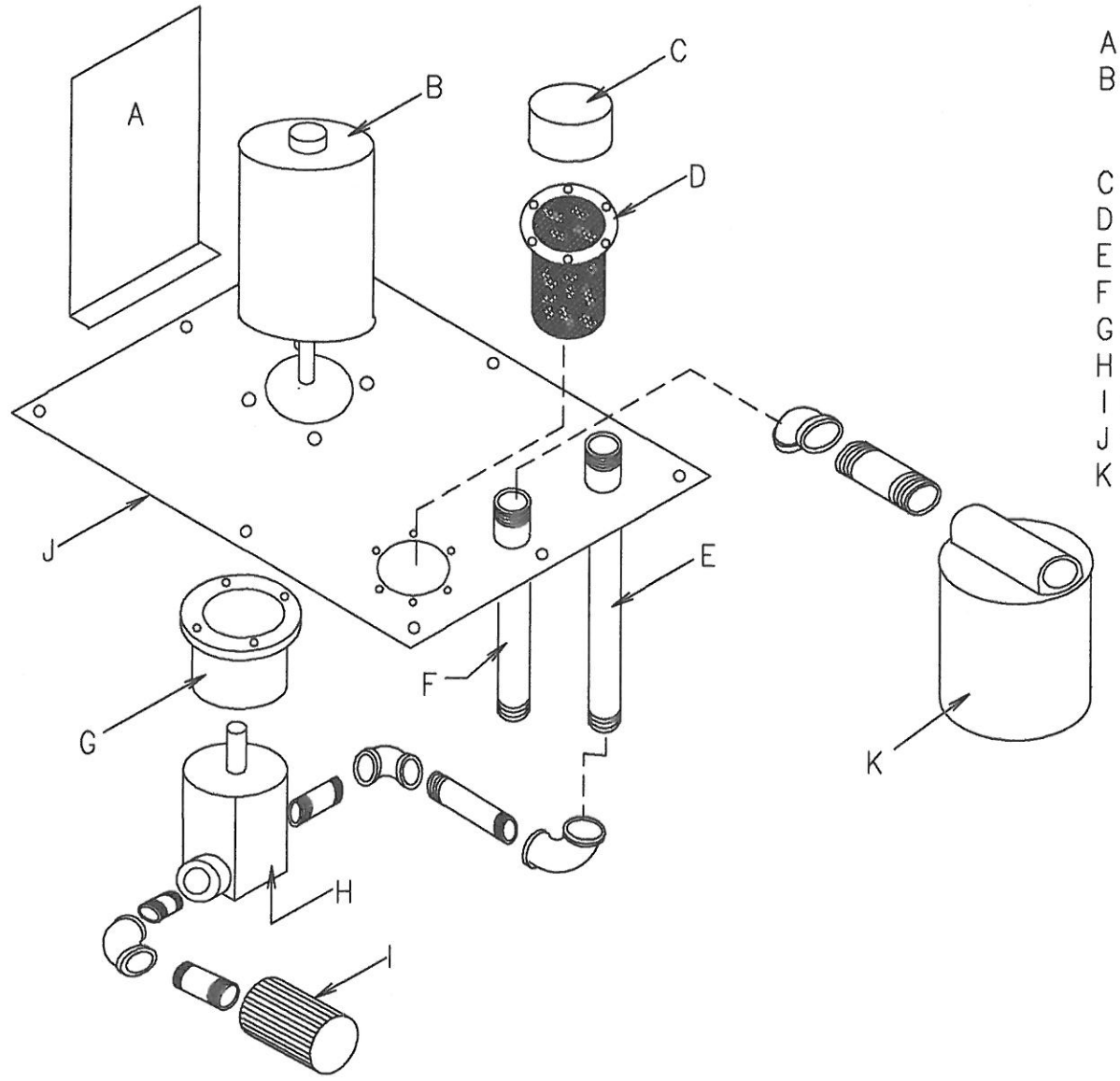
1. Abrasive dirt in hydraulic oil being circulated through the system. Drain the oil and replace filters, in the intake and return lines.
2. System pressure is exceeding pump rating.
3. Check for pump mis-alignment or bolts loose.

PUMP PARTS INSIDE HOUSING BROKEN:

1. Seizure due to lack of oil.
2. Excessive pump pressure above pump rating.
3. Excessive torquing of housing bolts.
4. Solid matter being drawn in from reservoir and wedged in pump.
5. Oil temperature should not exceed 145°F.

DIRTY OIL:

1. Components not properly cleared after servicing.
2. Fill pipe screen broken or missing.
3. Air breather cap left off.
4. Pipes not covered while servicing machine.
5. Filter elements not replaced at regular intervals. Should be replaced after first 100 hours and then every 500 hours.

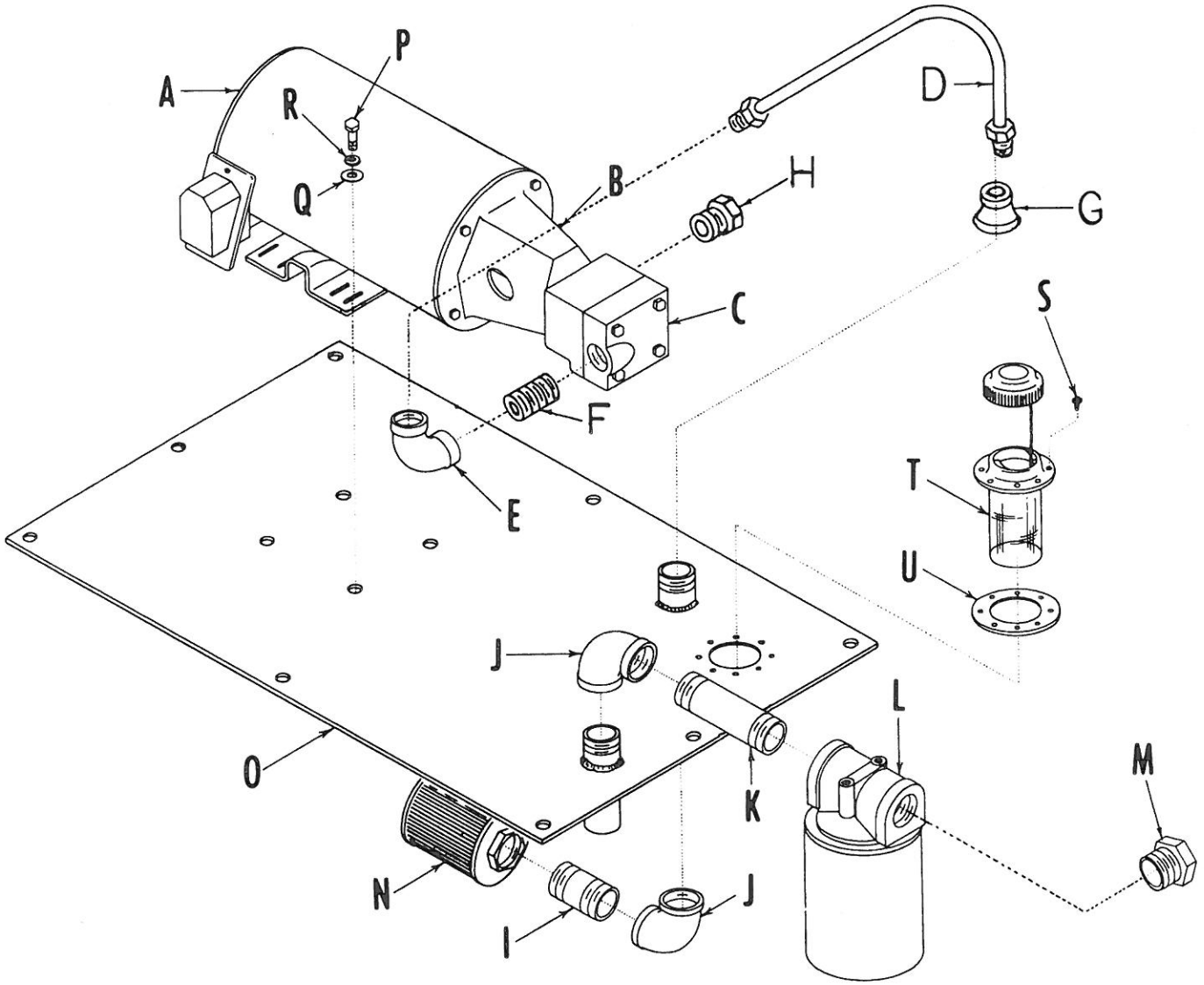


A Control box bracket.
B Pump motor.
004126 3 Ph.
004120 1 Ph.
C Oil fill cap.]
D Oil fill strainer.] --060079
E Oil presure line.
F Oil return line.
G Pump adaptor. ----060077
H Pump. --060060
I Oil Intake filter. ----060078
J Oil tank cover.
K Oil return line filter.-060075

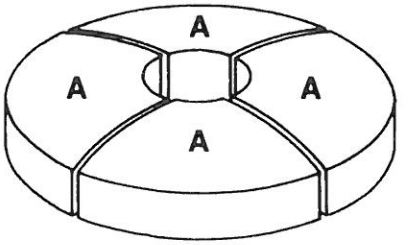
Hydraulic Pump Assembly

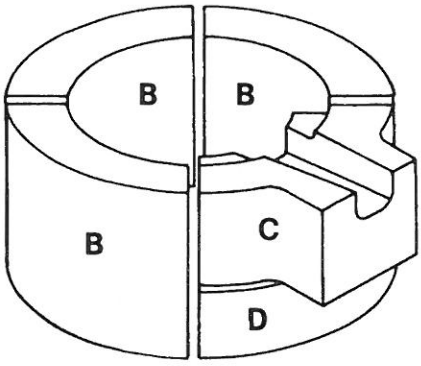
(older models)

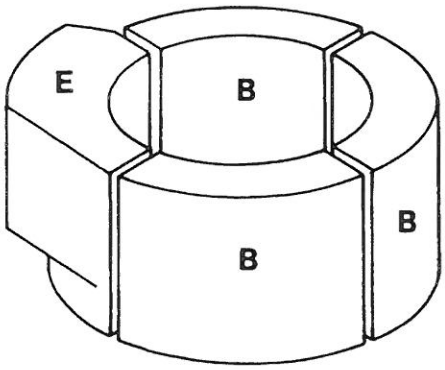
A	**004114**	Motor	1
B	**060077**	Mounting adaptor	1
C	**060060**	Gear pump	1
D	**060035**	11½" hose	1
E	**003387**	3/8" extra heavy elbow	1
F	**003026**	3/8" x H close nipple	1
G	**003201**	3/8" x 3/4" x H red. coupling	1
H	**003337**	½" x 3/8" red.bushing	1
I	**003061**	3/4" close nipple	1
J	**003375**	3/4" elbow	1
K	**003068**	3/4" x 5" nipple	1
L	**060075**	Return filter	1
M	**003353**	3/4" x 3/8" red. bushing	1
N	**060078**	Fluid pick up strainer	1
O	**102701**	Reservoir top	1
P	**000708**	¼" x 1" hex hd bolt	4
Q	**002111**	¼" flat washer	4
R	**002112**	¼" lock washer	4
S		10-32 self tapping screw (included in T)	6
T	**060079**	Filler breather	1
U		Breather gasket (incl. in T)	1

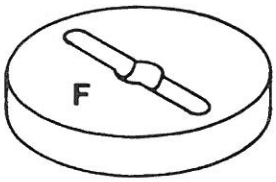


RELINING INSTRUCTIONS FOR SPEEDY MELT MODEL T-160 FURNACE









	OPN	DESCRIPTION	QTY
A	008002	Lid Section	4
B	008000	Solid Side Liner	6
C	008019	Pour Spout	1
D	008016	Liner Spacer	1
E	008003	Burner Brick	1
F	008004	Bottom Brick	1
	008141	Matrilite 55#	2
	008173	box of sealer	

The material used in the manufacture of the lining and lid for these Speedy Melt Furnaces is High Alumnia refractory. This material is one of the best available, designed to withstand the extreme temperatures, drastic temperature changes and high velocity circulation encountered in top performing crucible melting furnaces. The fusion point of this material is near 3300°F. DOMESTIC FIRE CLAY REFRACTORY, NORMALY USED, IS ENTIRELY UNSATISFACTORY. All shapes are compressed under extreme pressures, and kiln burned at temperatures approaching 2600°F.

The MIFCO Furnaces have been designed so that relining is rapidly and easily done. Complete relining kits are available as a package unit. These kits include all replacement refractory shapes, insulation and the correct type of High-Alumina refractory mortar. Structural parts of the furnace which are subject to normal abuse, and may need replacement, are available. Relining procedure is as follows:

1. Remove blower and mixer-burner assembly from furnace.

2. Remove front bolt from lid band, spread lid band, remove the four lid brick sections, "A".

3. Remove lid lift assembly by lifting out of the base tube. Replace lid band if damaged or burned, being careful not to lose collar bushings in jack tube. Replace both lid support rods if bent or burned.

4. Remove the four top cast iron segments by removing hex nuts on top of furnace. Remove all insulation and refractory from the furnace shell. Remove and replace seal hold down bolts if broken.

5. Mix part of refractory sealer to consistency of heavy cream for mortaring ,joints.

6. Locate burner row, 4 bricks banded together. DO NOT REMOVE THE BANDS. Cement I.D. of burner tunnel and O.D. of guide tube to prevent flame leakage. Place ring of bricks down over the burner guide tube, center bricks in shell.

7. Cement bottom brick in place, with drain grooves up by placing thick layer of sealer in bottom of shell first. Fill any cracks around bottom brick with sealer.

8. Wet brick surfaces to be mortared, with water. This improves the mortar joints. Dry bricks absorb moisture from mortar too rapidly, resulting in weak joints. Use a brush or sponge to saturate surface with water.

9. Cement second ring of four solid liner bricks in place by placing a thick layer of sealer on top of bottom row of bricks. Sit second row in place, staggering bricks to split the joints. Level top surface of second ring with top of furnace so lid will seat properly.

10. Locate a piece of plywood or steel and place in front of pour spout brick "C". This will prevent insulation from escaping around brick. Leave this board in place until insulation has been dried.

11. Mix PRE-MIXED INSULATION with sufficient water to the consistency of plaster. Pour insulation between shell and refractory lining. Prod while pouring to form an even distribution of insulation. Fill to height of liners. Allow to sit approximately 30 minutes and then fill to the top again. Tap side of shell with a mallet very lightly.

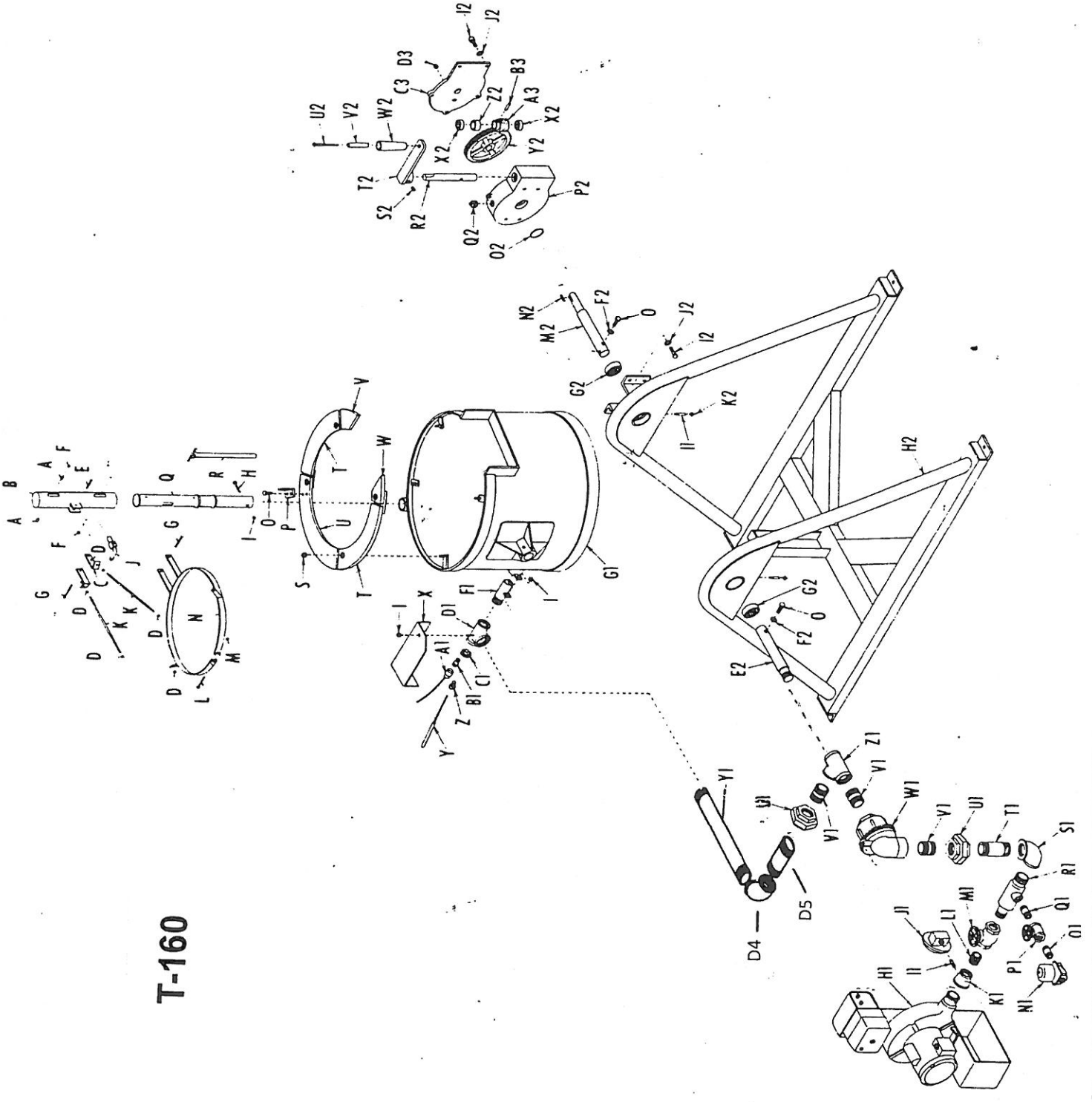
12. Replace top seal segments and bolt down in place. Spread lid band and place four lid segment sections on top of furnace chamber lining. Align grooves in O.D. of the lid brick to match holding lugs in lid band. Press or tap each top segment down to seat against chamber lining. Replace the front lid band bolt and tighten snug. DO NOT OVER TIGHTEN. OVER TIGHTENING WILL CAUSE THE LID BRICKS TO CRACK WHEN THEY EXPAND FROM HEATING.

13. Remove lid assembly from furnace, place upside down on floor and paint the under side with sealer. Place back in position and paint the top the same way. At the same time paint entire furnace chamber, with a light layer of sealer. DO NOT PLUG BURNER HOLE WITH SEALER.

14. Place burner back into the guide tube, bolting in place.

15. Furnace should set for 24 hours to cure insulation, then fire at low fire for one hour to remove moisture. The following day, fire as desired. Firing at HI-FIRE right away will cause steam to form in the bricks and blow them apart.

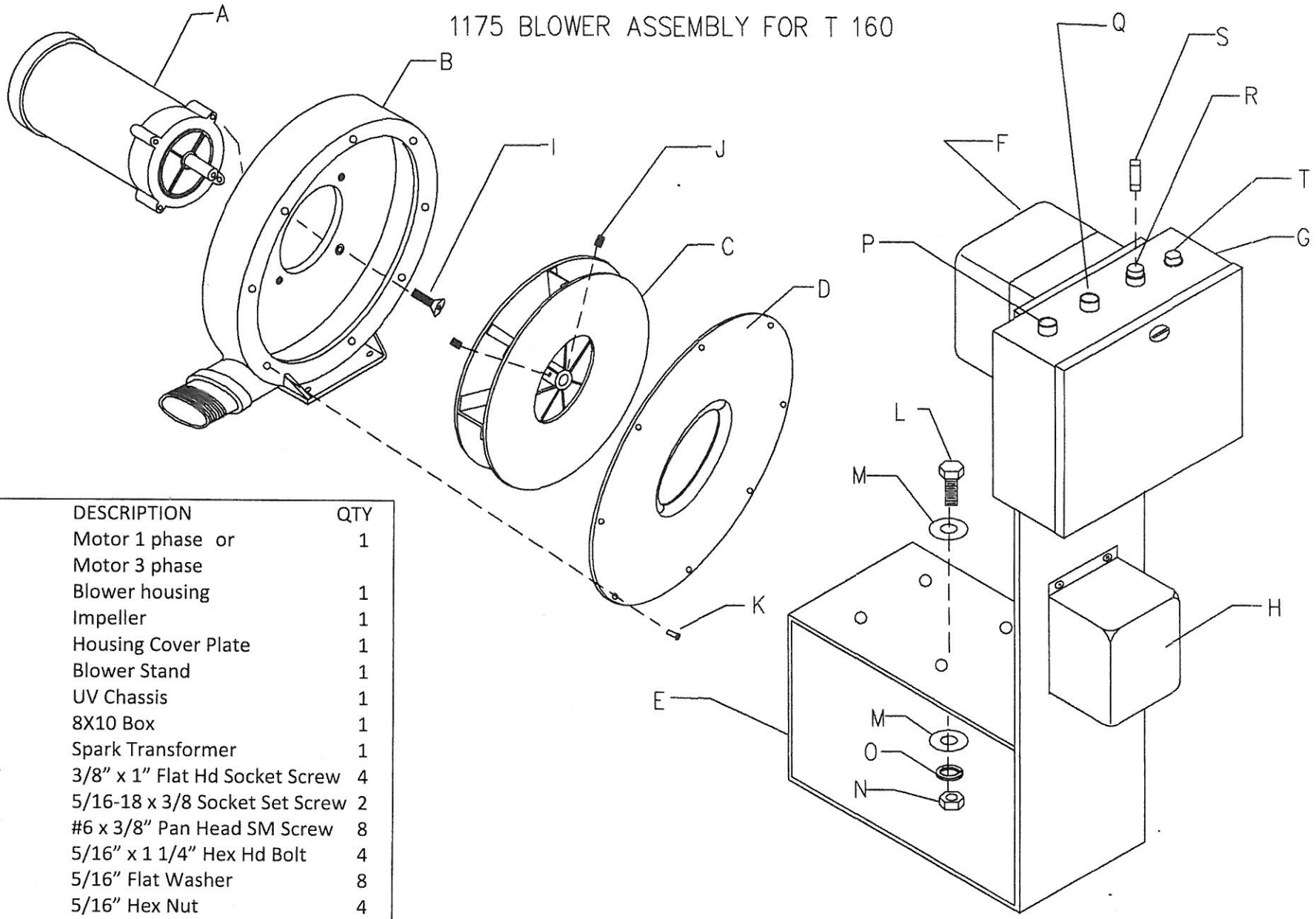
NOTE: REFER TO REFRACTORY MAINTENANCE.


T-160

McEnglevan Parts List T-160 (02/12)

	OPN	Description
A	010009	Lid lift bushing
B	010003	Swivel pipe
C	010008	Support rod bracket
D	002016	3/8"-16 jam nut
E	000711	¼-20 x 1 ¾" HH screw
F	002017	3/8" lock nut
G	001214	3/8-16 x 3 ¼ hex bolt
H	001208	3/8 x 1 ¾ bolt
I	002017	3/8" top lock nut
J	010006	Lid lift fulcrum bar
K	100475	Lid lift support rod
L	001211	3/8 x 2 ½ HH bolt
M	002015	3/8" hex nut
N	100470	Lid band
O	001205	3/8" x 1" hex bolt
P	100463	Lid stop
Q	101811	Jack tube
R	010070	Lid lift handle
S	002012	5/16" jam nut
T	008601	Seal section
U		Seal section with lid stop
V	101749	Short seal section –drive side
W	101748	Short seal section-blower side
X	006690	UV Scanner Cover
Y	004068	7" spark electrode
Z	003408	Compression fitting
A1	004107	UV1A6 flame scanner
B1	003024	½ x 3/8 reducing nipple
C1	006665	UV plug
D1	003293	1 ½" x 1 ½" x 2" uv tee
F1	006600	Burner nozzle
G1	101710	Furnace shell assembly
H1		Blower assembly
I1	003002	1/8" x 2" nipple
J1	004226	Air pressure switch
K1	003220	1 ¼" x 2" coupling
L1	003106	1 ¼" close nipple
M1	003430	1 ¼" gate valve
N1	004214	¾" gas solenoid
O1	003064	¾" x 3" nipple
P1	003428	¾" gate valve
G1	003085	1" close nipple
Q1	003061	¾" close nipple
R1	006040	GM75 gas air mixer
S1	003385	1 ½" x 2" elbow
T1	003148	2" x 6" nipple
U1	003370	2" union
V1	003140	2" close nipple
Y1	101752	2" x 13 3/8" nipple
Z1	003272	2" x 1" x 2" tee
E2	101738	Blower side pivot axle
F2	002122	3/8" Lock washer
G2	101739	Pivot bearing
H2	101720	Base assembly
I2	000905	5/16" x 1" hex bolt
J2	002116	5/16" lock washer
K2	002454	Grease fitting
M2	101737	Drive side pivot axle
N2	040069	Key
O2	101755	Gear box drive "O" ring
P2	101722	Gear box
Q2	003322	1/4" pipe plug
R2	101733	Worm shaft
S2	001054	5/16" x ½" socket hd ss
T2	101743	Hand crank assm
U2	000630	3/8" x 4" rd hd ms
V2	102099	Handle tube
W2	040093	Black plastic handle
X2	101756	Thrust bearing
Y2	101735	Worm gear
Z2	101734	Worm spacer
A3	101736	Hub
B3	002404	3/16" x 1" spring pin
C3	101732	Gear box lid
D3	003322	¼" blk plug
D4	003379	2" 90 deg elbow
D5	101753	2" x 6 ¼" nipple

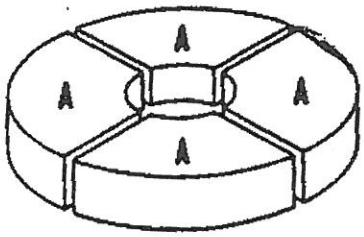
1175 BLOWER ASSEMBLY FOR T 160

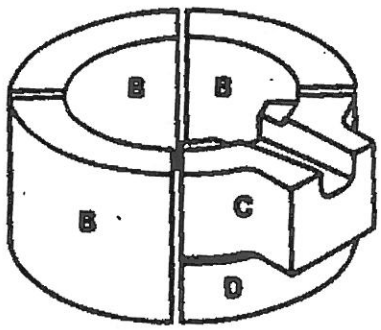


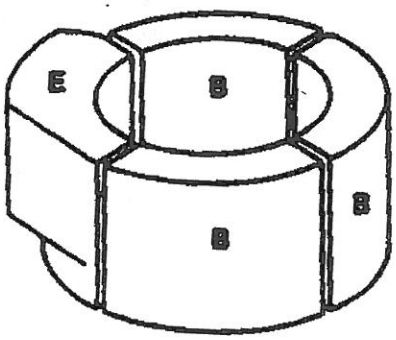
	OPN	DESCRIPTION	QTY
A	004117	Motor 1 phase or	1
	004118	Motor 3 phase	
B	008612	Blower housing	1
C	004326	Impeller	1
D	008621	Housing Cover Plate	1
E	006210	Blower Stand	1
F	004445	UV Chassis	1
G	003852	8X10 Box	1
H	003915	Spark Transformer	1
I	001254	3/8" x 1" Flat Hd Socket Screw	4
J	001053	5/16-18 x 3/8 Socket Set Screw	2
K	000107	#6 x 3/8" Pan Head SM Screw	8
L	000930	5/16" x 1 1/4" Hex Hd Bolt	4
M	002115	5/16" Flat Washer	8
N	002011	5/16" Hex Nut	4
O	002116	5/16" Lock Washer	4
P	003663	Red Stop Button	1
Q	003662	Black Start Button	1
R	003600	Fuse Holder	1
S	003624	5 Amp Fuse	1
T	003906	Red Indicator Light	1

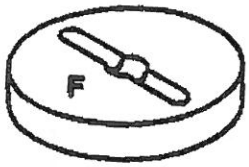
Blower Explo

RELINING INSTRUCTIONS FOR SPEEDY MELT MODEL T-301









	OPN	Description	Qty
A	008008	Lid Section	4
B	008005	Solid Side Liner	6
C	008116	Pour Spout	1
D	008117	Liner Spacer	1
E	008009	Burner Brick	1
F	008007	Bottom Brick	1
	008141	Matrilite #28AC - (bags)	2
	008173	Refractory Sealer - (box)	1

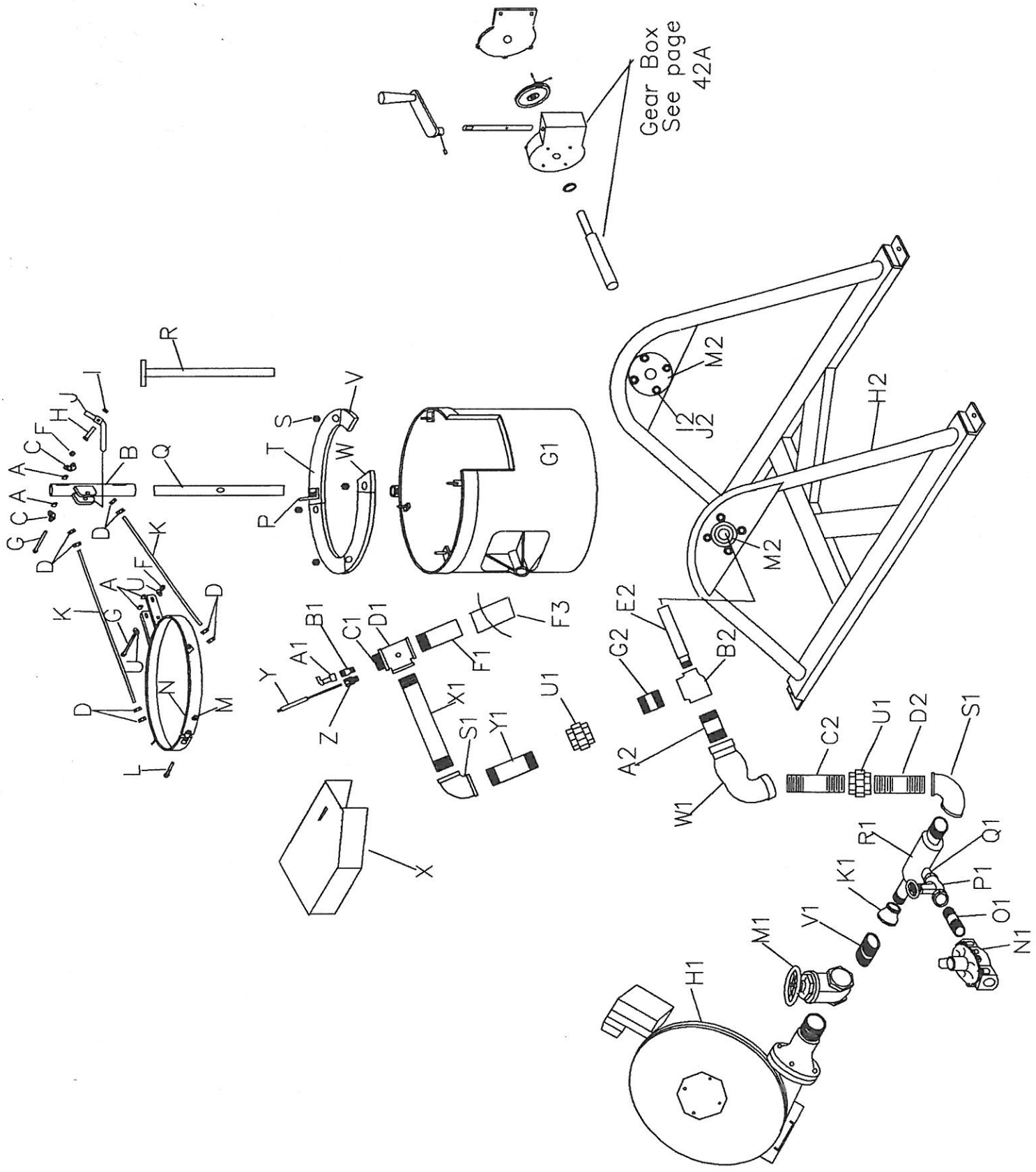
1. Remove blower and mixer-burner assembly from furnace.
2. Remove front bolt from lid band, spread lid band, remove the four lid brick sections,"A".
3. Remove lid lift assembly by lifting out of the base tube. Replace lid band if damaged or burned, being careful not to lose collar bushings in the jack tube. Replace both lid support rods if bent or burned.
4. Remove the four top cast iron segments by removing hex nuts on top of furnace. Remove all insulation and refractory from the furnace shell. Remove and replace seal hold down bolts if broken.
5. Mix part of refractory sealer to consistency of heavy cream for mortaring joints.
6. Locate burner row (4 bricks banded together). DO NOT REMOVE THE BANDS. Cement I.D. of burner tunnel and O.D. of guide tube to prevent flame leakage. Place ring of bricks down over the burner guide tube. Center bricks in shell.
7. Cement bottom brick in place, with drain grooves up, by placing thick layer of sealer in bottom of shell first. Fill any cracks around bottom brick with sealer.
8. Wet brick surfaces to be mortared with water. This improves the mortar joints. Dry bricks absorb the moisture from mortar too rapidly, resulting in weak joints. Use a brush or sponge to saturate surface with water.
9. Cement second ring of four solid liner bricks in place by placing a thick layer of sealer on top of bottom row of bricks. Sit second row in place, staggering bricks to split the joints. Level top surface of second ring with top of furnace so lid will seat properly.
10. Locate a piece of plywood or steel and place in front of pour spout brick "C". This will prevent insulation from escaping around brick. Leave this board in place until insulation has been dried.
11. Mix PRE-MIXED INSULATION with sufficient water to form the consistency of plaster. Pour insulation between shell and refractory lining. Prod while pouring to form an even distribution of insulation. Fill to height of liners. Allow to sit approximately 30 minutes and then fill to the top again. Tap side of shell with a mallet very lightly.

12. Replace top seal segments and bolt down in place. Spread lid band and place four lid segment sections on top of furnace chamber lining. Align grooves in O.D. of the lid brick to match holding lugs in lid band. Press or tap each top segment down to seat against chamber lining. Replace the front lid band bolt and tighten snug. DO NOT OVER-TIGHTEN. OVER-TIGHTENING WILL CAUSE THE LID BRICKS TO CRACK WHEN THEY EXPAND FROM HEATING.

13. Remove lid assembly from furnace. Place upside down on floor and paint the underside with sealer. Place back in position and paint top the same way. At the same time paint entire furnace chamber with a light layer of sealer. DO NOT PLUG BURNER HOLE WITH SEALER.

14. Place burner back into the guide tube, bolting in place.

15. Furnace should set for 24 hours to cure insulation. After this 24 hour period, fire at low fire for one hour to remove moisture. The following day, fire at low fire for 4 hours and then slowiy increase heat to about 1/2 open and continue until the furnace is at 2000°. Hold it at that temperature for 2 hours.


Gear Box
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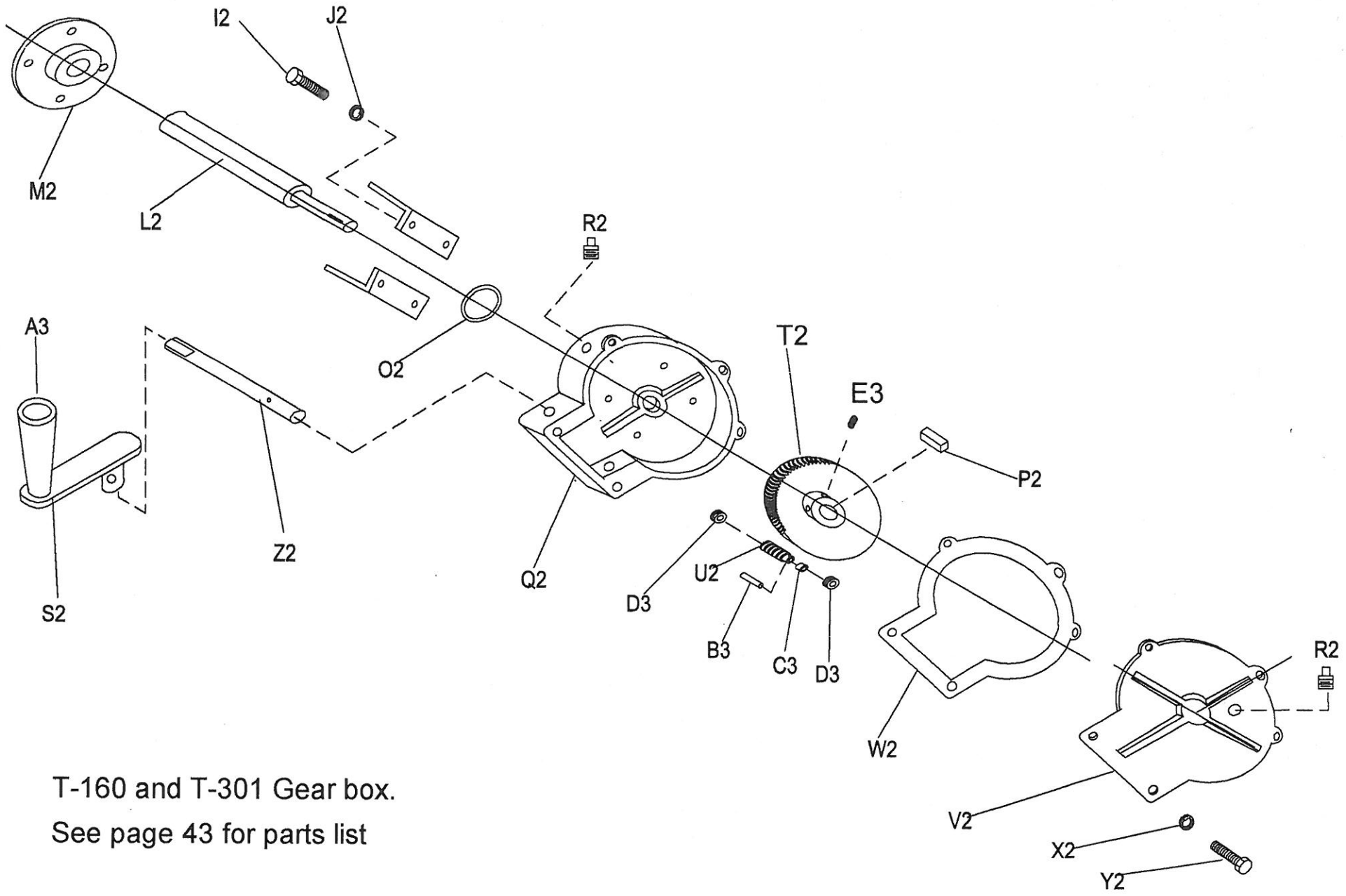
T–301



T-160 and T-301 Gear box.

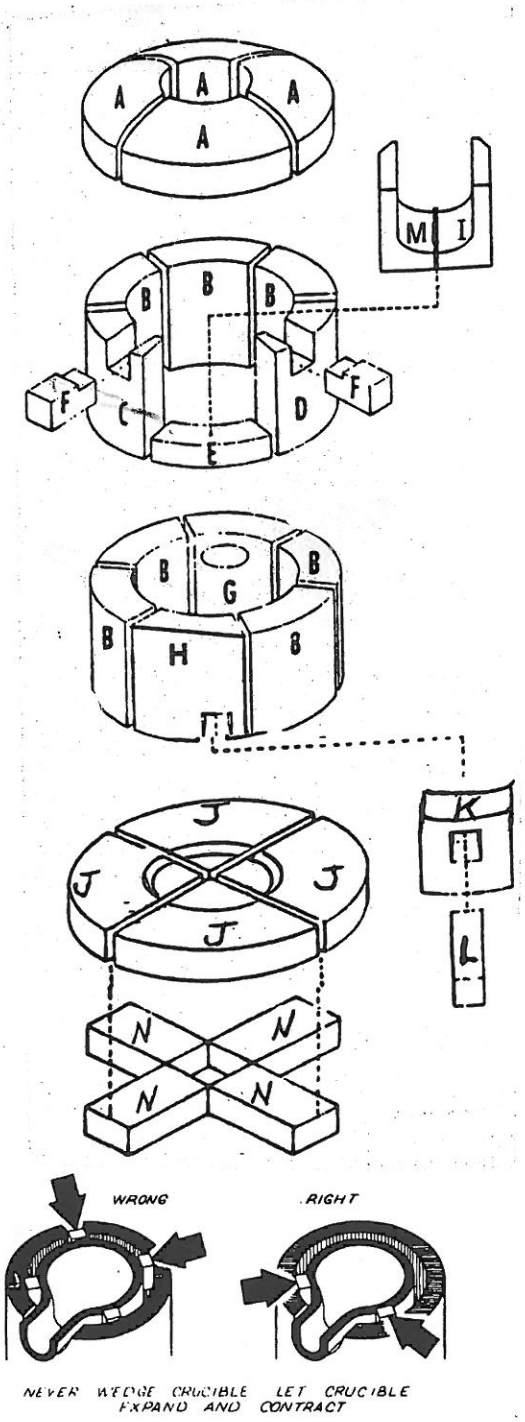
See page 43 for parts list

T-301 Parts List-
05/07/12

	OPN	Description	Qty.
A	010009	Lid Lift Bushing	4
B	010001	Swivel Pipe Assm	1
C	010008	Support Rod Bracket	2
D	002016	3/8" Jam Nut	8
E			
F	002017	3/8" Lock Nut	2
G	001213	3/8" x 3" Hex Bolt	2
H	000711	1/4-20 x 1 3/4" bolt	1
I	002009	1/4-20 Lock Nut	2
J	010006	Lid Lift Fulcrum Bar	1
K	100476	Lid Support Rods	2
L	001211	3/8" x 2 1/2" Hex Bolt	1
M	002015	3/8" Hex Nut	11
N	100660	Lid Band	1
O	001205	3/8" x 1" Hex Bolt	4
P	100463	Lid Stop	1
Q	102237	Jack Tube 30 1/2" Long	1
R	010070	Lid Lift Handle	1
S	002012	5/16" Jam Nut	4
T	008602	Top Seal Section	3
U	002121	3/8" Std Flat Washer	2
V	102218-R	Short Top Seal - gear side	1
W	102218-L	Short Top Seal - blower side	1
X	006690	Scanner Cover	1
Y	004068	7" ignition electrode	1
Z	003408	Compression Fitting	1
A1	004109	UV Scanner	1
B1	003024	1/2" x 3/8" Reducing Nipple	1
C1	006686	2" UV Plug	1
D1	003309	2"Tee with screw	1
E1			
F1	006607	2" Burner Nozzle	1
G1	102210	T-301 Furnace Shell	1
H1		1610 Blower Assembly	1
I1			1
J1			
K1	003224	1 1/2" x 2" Reducing Coupling	1
L1			
M1	003431	1 1/2" Air Control Valve	1
N1	004215	1" Gas Solenoid Valve	1
01	003088	1" x 3" Pipe Nipple	1
P1	003429	1" Gas Adjusting Valve	1
Q1	003085	1" Close Nipple	1

	OPN	Description	Qty.
R1	006060	GM-100 Gas/Air Mixer	1
S1	003379	2" Elbow - 90 deg	2
T1			
U1	003370	2" Union	2
V1	003140	2" Close Nipple	1
W1	003504	2" Swivel Joint	1
X1	003162	2" x 13 1/4" Nipple	1
Y1	003163	2" x 6 1/2" nipple	1
Z1			
A2	003144	2" x 4" Nipple	1
B2	003272	2" x 1" x 2" tee	1
C2	003151	2" x 8" Nipple	1
D2	003149	2" x 7" Nipple	1
E2	101738	Pivot axle -Blower	1
F2			
G2	003142	2" x 3" Nipple	1
H2	102230	Furnace Frame	1
I2	000909	5/16" x 3/4" Hex Bolts	4
J2	002116	5/16" Lock Washers	4
K2			
L2	102219	Pivot Axle-Drive Side	1
M2	101739	Pivot Bearing	2
N2			
02	101755	Gear Box Shaft Seal	1
P2	040069	Drive Shaft Key - 1/4" x 1"	1
Q2	101722	T-301 Gear Box	1
R2	003322	1/4" Pipe Plug	2
S2	101743	Handle Assembly	1
T2	101735	Worm Gear	1
U2	101736	Worm	1
V2	101732	T-301 Gear Box Cover	1
W2	008186	Gear Box Gasket	1
X2	002116	5/16" Lock Washer	5
Y2	000905	5/16" x 1" Hex Bolt	5
Z2	101733	Worm Shaft	1
A3	040093	Plastic Handle	1
B3	002404	3/16" x 1" Spring Pin	1
C3	101734	Worm Spacer	1
D3	101756	Worm Thrust Bearing	2
E3	000653	1/4-20 x 3/8" Set Screw	1
F3	100673	Burner Guide Tube	1

RELINING INSTRUCTIONS FOR T-80 FURNACE



OPN		DESCRIPTION	QTY
A	008022	Lid Section	4
B	008010	Solid Side Liner	7
C	008107	Left Wedge Liner	1
D	008108	Right Wedge Liner	1
E	008109	Space Liner	1
F	008111	Crucible Wedge	2
G	008011	Burner Liner	1
H	008114	Single Burner Drain Opening	1
I	008110	Trough - Right Side	1
J	008015	Bottom Liner	4
K	008103	Drain Tile	1
L	008160	Drain Hole Plug	1
M	008113	Trough - Left Side	1
N	008162	Bottom Support Bricks	4
	008141	Matrilite Bags	6
	008173	Refractory sealer	

The MIFCO furnaces have been designed so that relining is rapidly and easily done. Complete relining kits are available as a package unit. These kits include all replacement refractory shapes, insulation and the correct type of refractory mortar. Structural parts of the furnace which are subject to normal abuse, and may need replacement, are available. Relining procedure is as follows:

1. Disassemble gas/air manifold and unbolt burner guide tubes from furnace shell. Remove burner'guide tubes.

2. Remove front bolt from lid band, spread lid band, remove the four lid brick sections.

3. Remove lid lift assembly by lifting out of the base tube. Replace lid band if damaged or burned. Replace both lid support rods if bent or burned.

4. Remove the top cast iron ring segments by removing hex nuts on top of furnace. Remove all insulation and refractory from furnace shell. Remove and replace seal hold down bolts if broken.

5. Mix part of the refractory cement to a consistency that will pour but not spread out too much for mortaring joints. Wet the brick surfaces to be mortared with water to improve mortar joints. Dry bricks absorb moisture from mortar too rapidly, which results in weak joints. Use a brush or sponge to saturate brick surfaces with water.

6. Locate the four N bricks 2 1/2" thick by 9" in length. Dip these bricks into the refractory sealer. Position these bricks in the bottom of the shell, as shown in the picture. The sealer will help hold the bricks in place.

RELINING INSTRUCTIONS FOR T-80 FURNACE - (cont.)

7. Mix 1- 55 lb. bag of Matrilite #28. Pour in the bottom of the shell, around the 9" straight bricks. Let set for 10 minutes and strike off flush with the tops of the bricks. Push the excess material to the outside, around the edge of the shell. Proceed to step 8.

8. The bottom brick consists of four (4) sections (J) banded together. Center them in the bottom of the shell. Place brick (K) in position after putting bottom in place. Do this before putting the second row of bricks in place. Insert brick (L) in place through (K) and (H) to make sure they line up. Per step five (5), wet the top of the bottom bricks and the bottom row of side liners thoroughly. Pour a ring of stiff mortar on top of the bottom brick in about an inch from the outside perimeter so that the bottom row of side liners will sit on top of the mortar. Set the ring of solid liners, (STILL BANDED) in place, rotating them slightly so that they will form a tight mortar joint with the bottom. The burner guide tube hole in brick (G) must also align with the burner guide tube. Should they not quite line up, rather than break the mortar joint, rotate the side liners and the bottom liners together. Drain side liner (H) must be to the front.

9. The burner guide tubes should now be put in place. To do this you must put a small amount of mortar on the interior surface of the burner hole where the guide tube goes and then insert the burner guide tube and bolt in place. Clean the mortar from the inside of the burner guide tube now, before it hardens.

10. The top row of bricks is banded together. DO NOT CUT THESE BANDS! Wet the mating surfaces between the top row and the bottom row and pour a ring of mortar on top of the bottom row. Set the top row of bricks in place, being sure to line up the pour spout opening in the brick with the furnace shell opening. Rotate the bricks slightly as you set them down to get a good seal between the rows. Now, cut the top band on the top row of bricks and remove the wood block in the pour spout opening. Wet and mortar all surfaces and cement pour spout bricks M and I into place, supporting the outer edge with a wedge to hold it in place.

11. Mix insulation with sufficient water to the consistency of plaster. Pour the mixed insulation between the furnace shell and the brick lining. Prod while pouring to assure an even distribution of insulation. Fill to the height of the furnace shell and tap shell sides with a rubber mallet to settle the cement. Wait 30 minutes and then refill to top again and strike off level.

12. Replace top seal segments and bolt down in place. Replace lid lift assembly after applying thin layer of grease to tube.

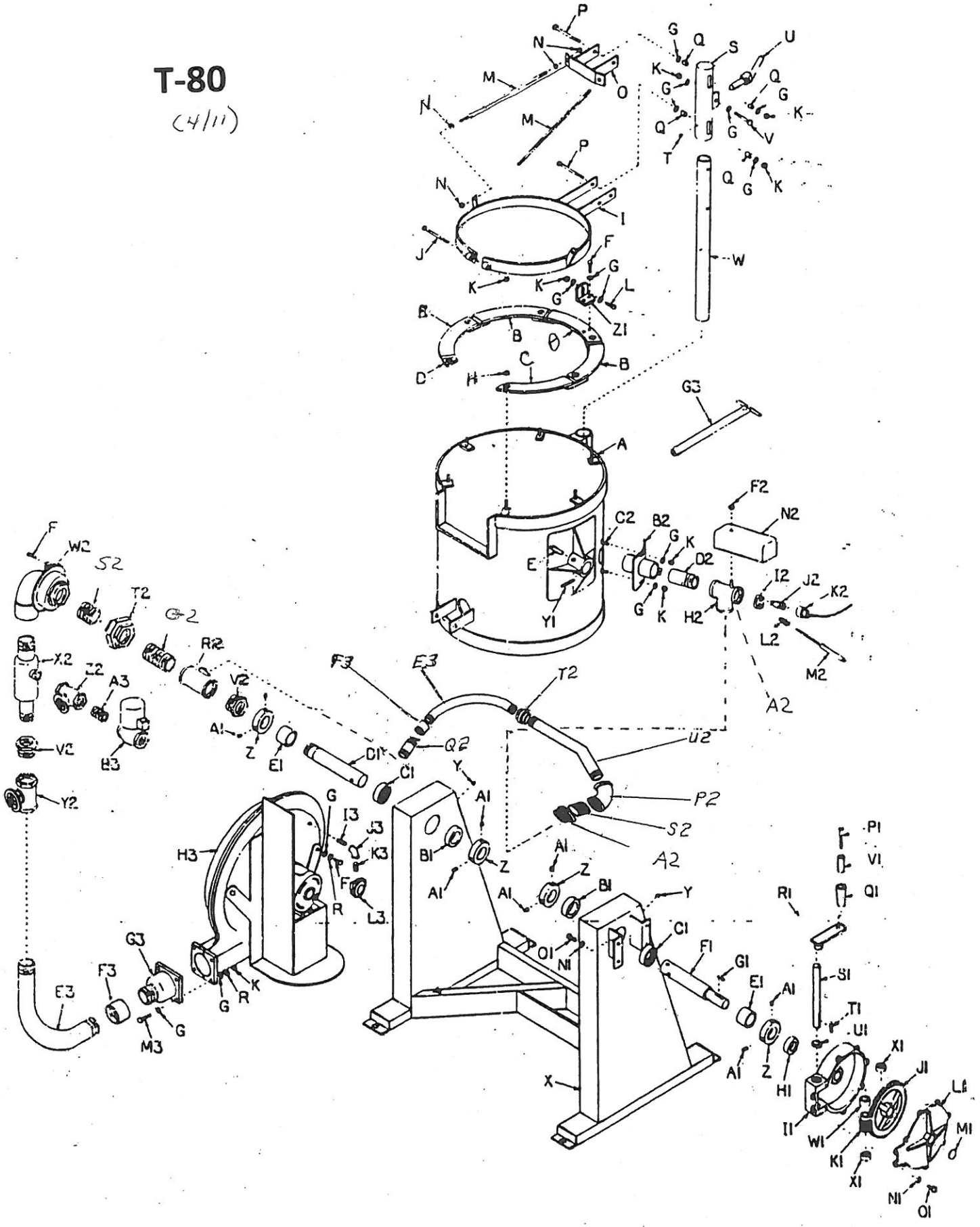
13. Spread lid band and place four lid segment sections on top of furnace chamber lining. Align grooves in O.D. of the lid brick to match holding lugs in lid band. Press or tap each top segment down to seat against chamber lining. Replace the front lid bolt and tighten snug. DO NOT OVER TIGHTEN! The lid brick will expand and crack if clamped too tightly. Remove the lid assembly from the furnace and place upside down on the floor.

14. Re-assemble burner manifold. Thin the mortar with water to the consistency of paint and brush all exposed liner surfaces. As explained above, wet the liner surfaces before coating. Do not block burner tunnels. Paint the underside of the lid. Grease the jack tube and replace lid onto furnace. Coat the top side of the lid.

15. Reconnect manifold and combustion safeguard leads to furnace body. Furnace should set for twenty-four (24) hours to cure insulation, then fire at low fire for one (1) hour to remove moisture. The following day, fire as desired. The furnace will emit steam and water from the lining when first fired. This is normal until the furnace is completely dry.

T-80

(4/11)



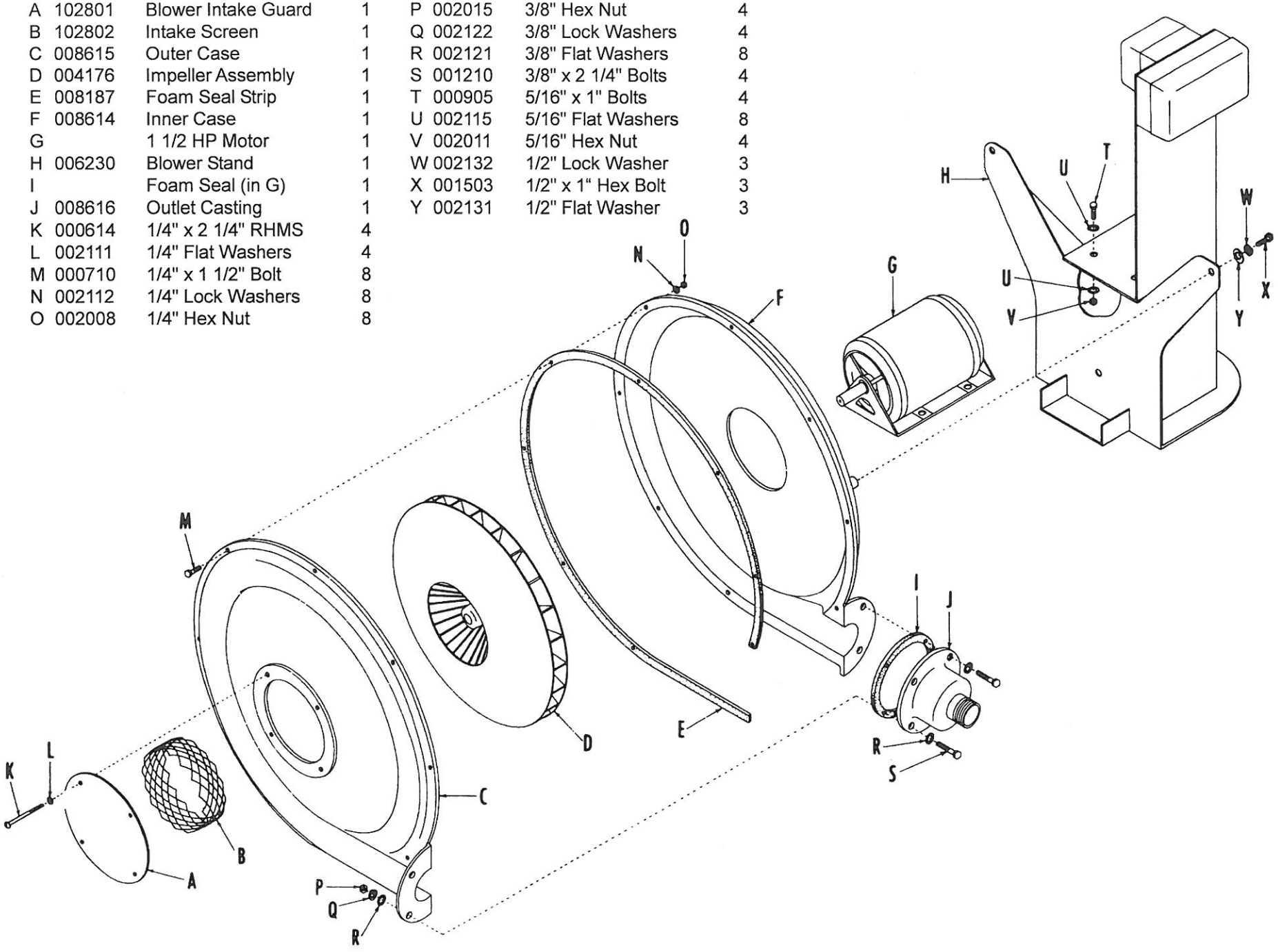
T-80 TILT FURNACE (MAIN ASSEMBLY) 7/12

OPN		Description	Qty.
A	102020	Steel shell assembly	1
B	008603	Top seal section	4
C	102042	Lid stop seal section	1
D	102043	Top seal spacer section	1
E	001503	1/2-13 x 1" hh bolt	2
F	001205	3/8" x 1" hex head bolt	6
G	002121	3/8" flat washer	25
H	002012	5/16" hex jam nut	2
I	100875	Lid band	1
J	001215	3/8" x 3½" hex head bolt	1
K	002015	3/8" hex nut	13
L	001209	3/8" x 2" hex head bolt	1
M	100874	Support rods	2
N	002022	½" hex nut	8
0	100950	Lid lift bracket	1
P	001217	3/8" x 4" hex head bolt	2
Q	010009	Spacer bushing	4
R	002122	3/8" lock washer	7
S	010063	Swivel pipe	1
T	010005	Drive in grease fitting	2
U	010065	Lid lift fulcrum	1
V	001207	3/8" x 1½" hex head bolt	1
W	102065	Jack tube	1
X	102071	Furnace base assm	1
Y	002454	Grease fitting	2
Z	102084	Fulcrum bar collar	4
A1	001602	½" x ½" socket hd set screw	8
B1	102085	Seal	2
C1	102086	Fulcrum bushing	2
D1	102087	Fulcrum bar, blower side	1
E1	102088	Bearing retaining sleeve	2
F1	102089	Fulcrum bar, drive side	1
G1	040069	Key	1
H1	102096	Gear box o'ring	1
I1	102090	Gearbox	1
J1	102093	Worm gear	1
K1	102092	Worm	1
L1	102091	Gear box cover	1
M1	002450	1 1/8" freeze plug	1
N1	002115	5/16" flat washer	13
01	000905	5/16" x 1" hx hd bolt	13
P1	000630	3/8" x 4" rd hd mach screw	1
Q1	102098	Hand wheel handle	1
R1	102102	Hand wheel	1
S1	102095	Hand wheel shaft	1

OPN		Description	Qty.
T1	040069	Shaft key	1
U1	102097	Seal (motorized only)	1
V1	102099	Handle tube	1
W1	102100	Worm spacer	1
X1	102101	Worm thrust bearing	2
Y1	001504	½" x 1 1/4" hex head bolt	2
Z1	102044	Lid swing stop	1
A2			
B2	102045	T-80 Burner guide tube	1
C2	000986	3/8" x 2" carriage bolt	4
D2	006625	2½" Burner nozzle	1
E2	000708	1/4" x 1" hex head bolt	2
F2	002008	1/4" hex nut	2
G2	102026	Plug retaining bar	1
H2	003310	2 1/2" UV tee	1
I2	006686	UV plug	1
J2	003024	½" x 3/8" reducing nipple	1
X2	004109	UV8A scanner	1
L2	003408	Compression fitting	1
M2	004068	7" spark electrode	1
N2	006690	UV cover	1
02	003379	2" 90 deg elbow	1
P2			
Q2			
R2			
S2	003140	2" close nipple	3
T2	003370	2" standard union	2
U2	003156	2" T80 formed conduit	1
V2	003348	2" x ½" hex bushing	2
W2	003504	2" flexo joint	1
X2	006070	GM 125 gas air mixer	1
Y2	003432	2" gate valve	1
Z2	003430	1 1/4" gate valve	1
A3	003109	1 1/4" x 3" nipple	1
B3	004216	1 1/4" gas solenoid	1
C3	003106	1 1/4" close nipple	1
D3			
E3	003390	2" long radius elbow	1
F3	003207	2" coupling	1
G3	008616	2" blower outlet incl.in H3	1
H3	900505	1611 blower assm	1
I3	003002	1/8" x 2" nipple	1
J3	003371	1/8" elbow	1
K3	003001	1/8" close nipple	1
L3	004226	Air pressure switch	1
M3	001210	3/8" x 2 1 /4" hex head bolt	4

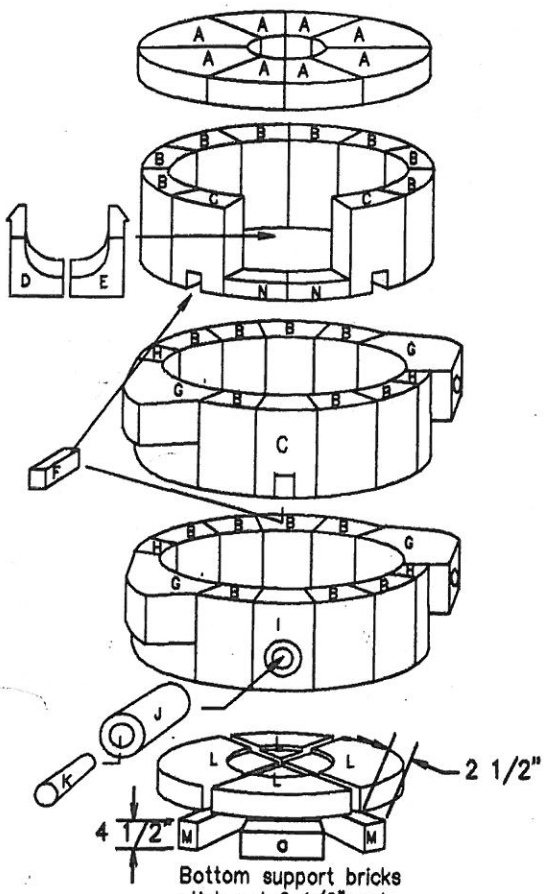
1611 Blower Assembly for T-80

	OPN	Description	Qty.		OPN	Description	Qty.
A	102801	Blower Intake Guard	1	P	002015	3/8" Hex Nut	4
B	102802	Intake Screen	1	Q	002122	3/8" Lock Washers	4
C	008615	Outer Case	1	R	002121	3/8" Flat Washers	8
D	004176	Impeller Assembly	1	S	001210	3/8" x 2 1/4" Bolts	4
E	008187	Foam Seal Strip	1	T	000905	5/16" x 1" Bolts	4
F	008614	Inner Case	1	U	002115	5/16" Flat Washers	8
G		1 1/2 HP Motor	1	V	002011	5/16" Hex Nut	4
H	006230	Blower Stand	1	W	002132	1/2" Lock Washer	3
I		Foam Seal (in G)	1	X	001503	1/2" x 1" Hex Bolt	3
J	008616	Outlet Casting	1	Y	002131	1/2" Flat Washer	3
K	000614	1/4" x 2 1/4" RHMS	4				
L	002111	1/4" Flat Washers	4				
M	000710	1/4" x 1 1/2" Bolt	8				
N	002112	1/4" Lock Washers	8				
O	002008	1/4" Hex Nut	8				



RELINING INSTRUCTION FOR T200 FURNACE

	OPN	Description	Qty
A	008130	Lid section	8
B	008131	Solid liner	22
C	008132	Crucible wedge liner	3
D	008138	Pour spout left half	1
E	008135	Pour spout right half	1
F	008133	Crucible support bricks	3
G	008090	Burner bricks	4
H	008136	Vertical half side liner	4
I	008139	Drain plug liner	1
J	008092	Drain tile	1
K	008088	Drain plug	1
L	008137	Bottom brick	4
M	008162	Bottom support brick 9 x 2 ½ x 4 ½	4
N	008134	Pour spout spacer	2
O	008164	Bottom support brick 13 ½ x 2 ½ x 4 ½	4
	008141	Bags of Matrilite 55#	14
	008191	Minro wash Z77-55#	1

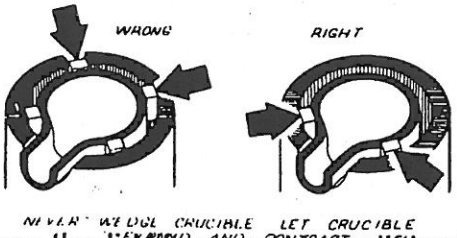


The MIFCO furnaces have been designed so that relining is rapidly and easily done. Complete relining kits are available as a package unit. These kits include all replacement refractory shapes, insulation and the correct type of refractory mortar. Structural parts of the furnace which are subject to normal abuse, and may need replacement, are available. Relining procedure is as follows:

1. Remove the burner manifold and burner nozzle from the furnace body.

2. Remove the burner guide tubes from the furnace shell.

3. Remove the front clamp bolt from the lid band. Spread the lid band and remove the eight (8) lid sections, "A" bricks.



4. Remove the lid lift assembly by lifting it out of the base tube. Replace lid band and lid support rods if damaged by heat. Be careful when disassembling not to lose any bearings or bushings in the jack tube.

5. Remove six (6) top seal sections around the top of the furnace by removing the hex nuts on the top of the furnace. Remove all refractory and insulation from the furnace shell. Replace seal hold down bolts if broken.

6. The three rows of bricks come banded together. Do not take off the bands! If the bricks are loose, place the row on a flat surface, top sided down arid drive a wooden wedge between the bands and the bricks to tighten them up.

7. Mix part of the refractory mortar with water until it is a little thinner than plaster.

8. Place the bottom support bricks (M & O) on the bottom of the furnace shell, per diagram, so that they are 4 1/2" from the furnace bottom to the top of the brick. Locate the bricks 5 1/2" from the outside shell so that they will be equally spaced so that when the bottom sections are put in, the joints will come over the brick as shown. Next, mix up enough insulation to cover the bottom of the furnace up to the top of the bricks, 4 1/2" deep. (See step 14 for insulation mixing instructions). Strike off the insulation, as soon as it has stiffened up some, to the top of the bricks.

9. Next, locate the bottom row in the furnace, making sure to put the drain hole in front and line up the burner holes. The best way to lower the bricks is with a hoist or lift truck. Cut a 1" pipe long enough to go from one burner hole to the other plus about 2 1/2". A stop can be welded in about 1 3/8" on both sides and a ring in the middle to hook the chain into. Put a ring of sealer around underneath the row of bricks after first wetting both mating surfaces with water. After you let the bricks down on the sealer, move them **back and forth to flatten out** the cement and get a good bond. Be sure the row of bricks is centered in the shell. Cement brick "J" in place to extend the bottom drain out of the furnace. Put in stopper "K" to be sure things are lined up. Cut out of either plywood or steel, a piece large enough to cover the drain hole. Trace around the tile, cut out the hole, slip tile up through the board and band this piece to the side of the shell. This will prevent insulation from running out onto the floor. Put plug "K" in position to make sure that they are lined up.

10. Take some of the mortar and smear it around the inside of the hole where the burner nozzles go in brick "G". Insert the burner nozzles and secure with bolts. Wipe all of the excess cement from the inside of the furnace guide tubes and the burner tunnel.

11. On top of row 1, moisten down the bricks, apply a layer of thick sealer and proceed with placement of row 2, lining up the burners. When you put in the burner guide tubes on the second row, it would be a good idea if you try the burner assembly in their respective guide tubes to be sure they fit before you tighten the bolts of the burner guide tubes.

12. On the top row, wet the mating surfaces between the top and the middle row. Pour a ring of sealer around on the top of the second row and set the top row down on the sealer, being sure to work the bricks around to insure a good bond. The bricks "D" must line up with the pour spout in the shell. Next, cut the top bands on the top row and cement in the pour spout with sealer. These two bricks ("D" and "E") will have to be supported on the outside with a board which also will serve as a form when pouring insulation. Cut a U shaped board and place around the pour spout bricks to help hold them in position and keep the insulation in the shell when poured.

13. Now it is time to mix the insulation. Find enclosed with your kit, 18 bags of castable insulation. When mixing the insulation, pour the water into the mixer first. Note the amount of water required on the bottom of the bag. We find that it is best to add 1/2 pint more water, (per bag), than the bag suggests. Note that you do not mix for a long time. You want the mixture to be able to flow into the areas around the burner bricks. It would be wise to use a vibrator or to prod with a board. You want to be sure that there are no air pockets anywhere around the burner bricks. Fill the insulation to the top of the bricks, plus about two inches. Let the insulation sit for about 1/2 hour, then with the insulation about 1/2 inch above the top of the bricks, replace the top seal segments.

14. Replace lid brick "A" and lid band bolt and tighten until snug. Tap band with mallet. This will shift bricks slightly to allow for additional tightening. Continue this until it will tighten no more and then back the nut off one (1) turn to allow for expansion of the bricks. Over tightening will cause the lid bricks to crack when they expand from heating.

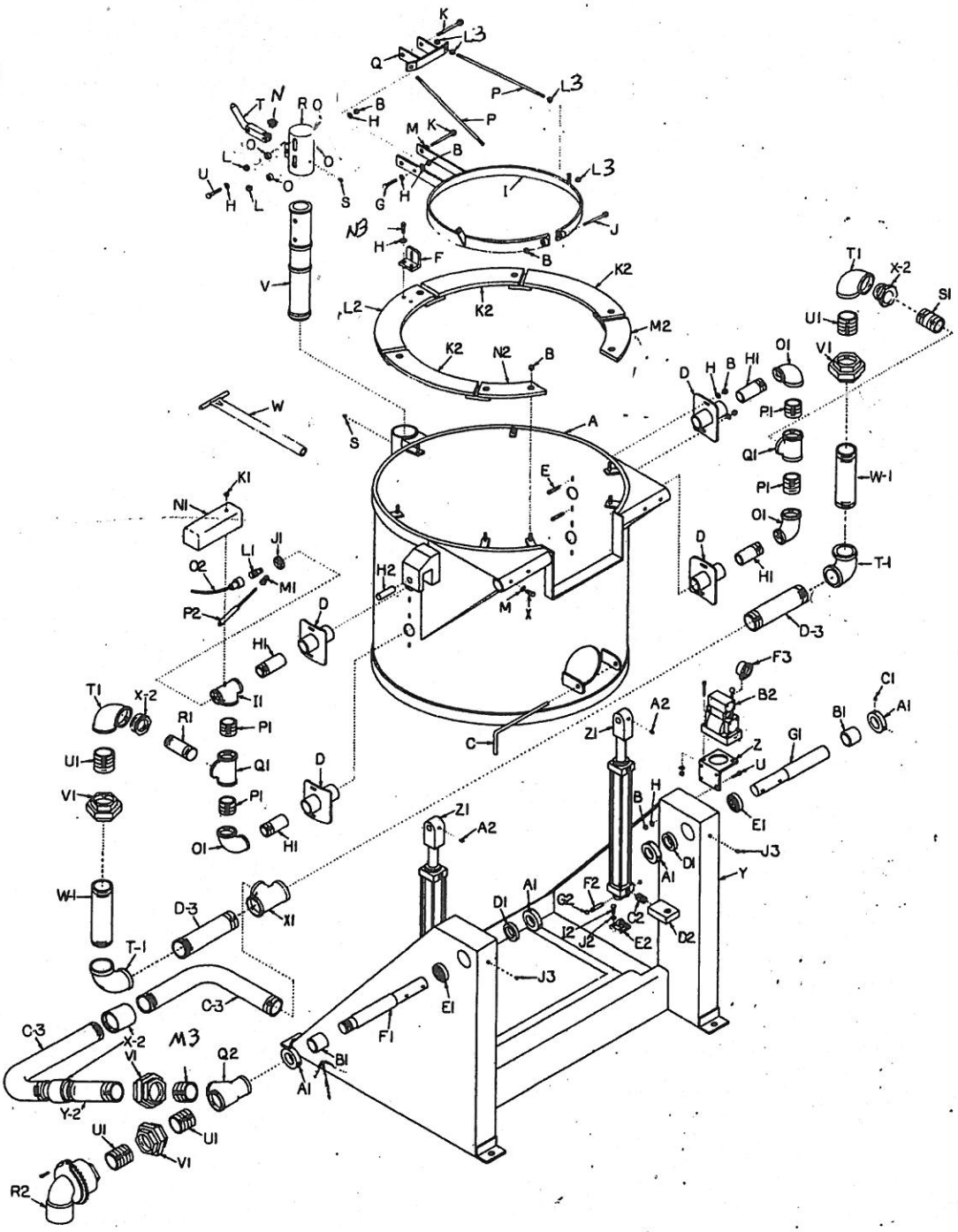
15. Add water to remaining mortar until you can brush it on and coat all surfaces of the furnace lining including the lid. **Do not get the mortar too thin** or it will come off as a powder when dry.

16. The furnace should set at least twenty-four hours to allow cement to cure. After this, the furnace should be fired slowly to dry out all moisture from the insulation and lining. Firing at Hi-Fire right away will cause steam to form in the bricks and blow them apart.

17. Put a coating of grease on the lid lift sliding parts before reassembly. Replace bricks "F" after crucible is in place. Do not cement these in place because they have to come out when changing crucible.

12/2012

T-200



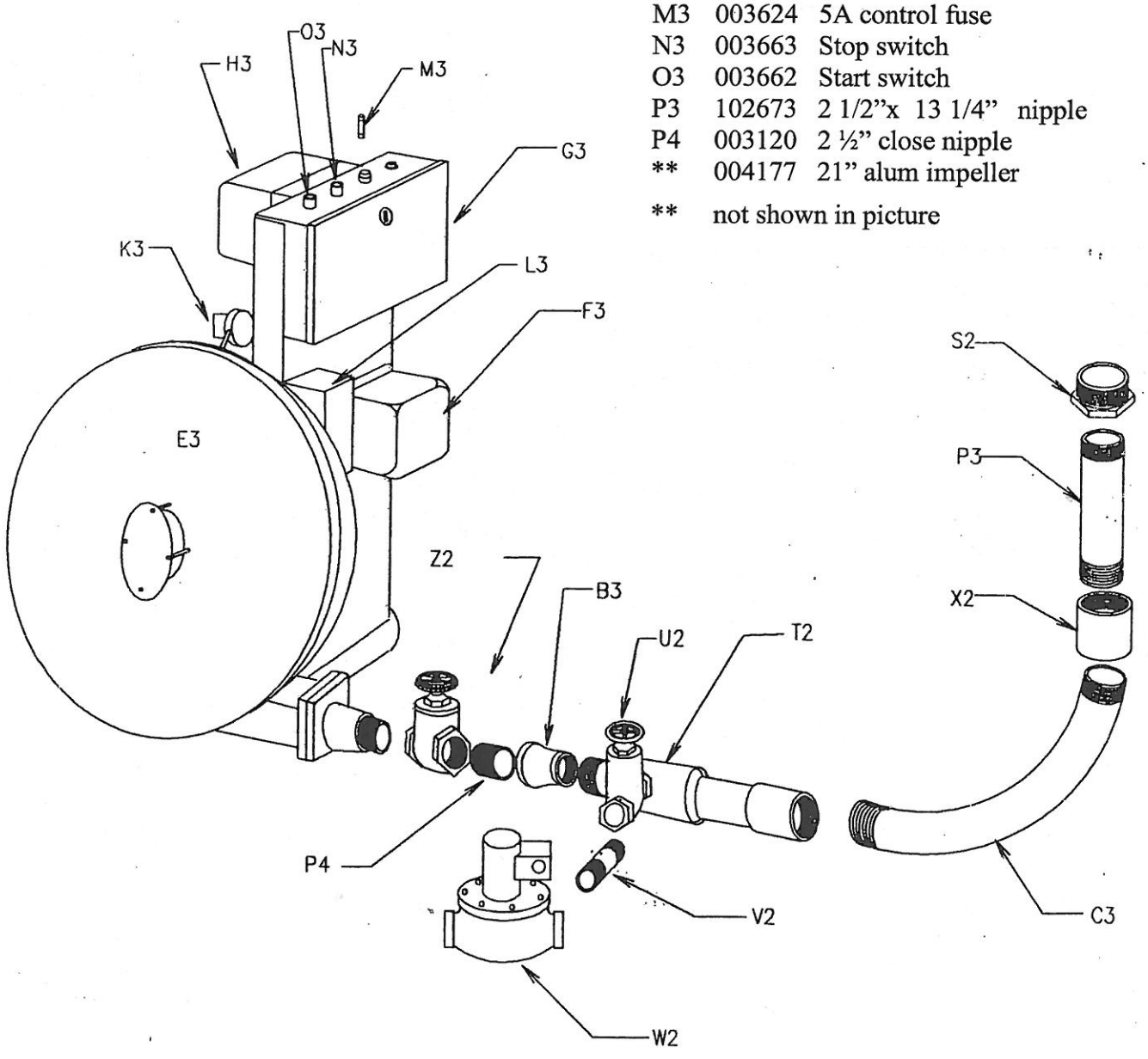
Parts list on next page

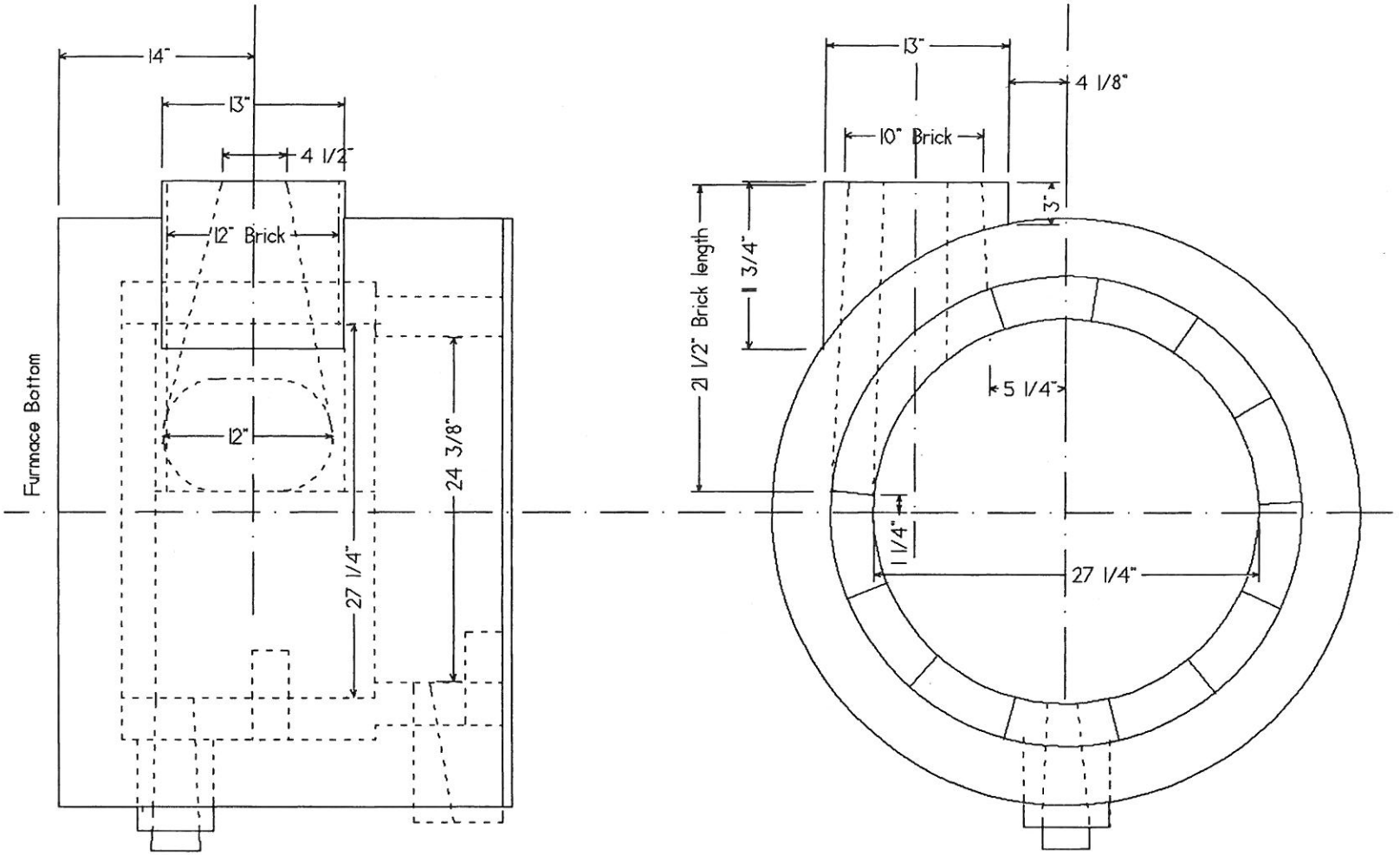
T-200 TILT FURNACE (MAIN ASSEMBLY) 12/2013

	OPN	Description	Qty.
A	102520	Steel shell assembly	1
B	002015	3/8"hex head nuts	18
C	102527	Plug retainer bar	1
D	102550	Burner guide tube assembly	4
E	001304	3/8"x 1 1/2" carriage bolt	8
F	102570	Lid swing stop	1
G	001206	3/8"x 1 1/4" hex head bolt	1
H	002121	3/8"flat washers	12
I	102581	Lid band complete	1
J	001213	3/8" x 3" hex head bolt	1
K	001518	½"x 5 1/2" hex head bolt	2
L	002024	½" hex lock nut	2
M	002131	½" flat washers	2
N	002467	Sealed bearing	1
O	002473	Radial bearings	4
P	102586	Support rods	2
Q	102587	Lid lift bracket	1
R	101081	Swivel pipe	1
S	010005	Drive in grease fittings	3
T	101087	Fulcrum rod	1
U	001208	3/8 x 1 3/4" hex head bolts	5
V	102621	Jack tube	1
W	102622	Lid lift handle	1
X	001557	½" x 1 ½"hex head bolts	4
Y	102631	Base	1
Z	102648	Hydraulic valve mount	1
Al	102084	Fulcrum bar collar	4
Bl	102088	Bearing retaining sleeve	2
Cl	001602	½"x 5/8"socket bd set screw	8
Dl	102085	Seal	2
El	102086	Bushing	2
Fl	102649	Fulcrum bar blower side	1
Gl	102650	Fulcrum bar, hydraulic side	1
H1	006611	Burner nozzle	4
I1	003293	1 ½" x 1 ½" x 2" tee	1
J1	006665	1 ½" UV plug	1
K1	002008	1/4" hex nut	1
L1	003024	½"x 3/8" reducing nipple	1
M1	003408	½"compression fitting	1
NI	101153	Scanner cover	1
O1	003385	2" x 1 ½"90 deg elbow	3
P1	003159	2" butt nipple	4
Q1	003311	2"tee	2
RI	003142	2" x 3' pipe nipple	1
SI	003150	2" x 7 ½"pipe nipple	1
TI	003407	2 1/2" 90 degree elbow	4
U1	003158	2 1/2"x 5" nipple	4
V1	003368	2 1/2" std union	4
W1	003168	2 ½" x 8"nipple	2
X1	003118	2 1/2" tee	1
Yl	102672	2 ½" long formed conduit	2
Z1	060020	Hydraulic cylinders	2
A2		Socket head set screw (Included in Z1)	2
B2	060000	Valve assembly (made up of)	1
		060007 Directional valve	
		060003 Relief valve	
		060006 Subplate	
C2	003026	3/8' close nipple XH	2
D2	060002	Check valve	2
E2	060080	Mounting plate	2
F2		Lower clevis pin (included with Z1)	2
G2		Snap rings (Included with Z1)	4
H2	060081	Pivot pin	2
I2	001208	3/8" x 1 3/4" hex hd bolt	8
J2	002122	3/8"lock washers	8
K2	102564	Solid seal section	3
L2	102566	Lid stop seal section	1
M2	102561	Right mount seal section	1
N2	102568	Left mount seal section	1
O2	004109	UV8A scanner	1
P2	004068	7" spark electrode	1
Q2	003118	2 ½ blk tee with	1
	003331	2 ½ x 1 ½ bushing	1
R2	003503	3" flexo joint	1
X2	003208	2 ½" coupling	2
Y2	102671	2 ½ x 34"nipple	1
A3	003140	2" close nipple	1
C3	003795	2 ½" long radius elbow	2
D3	102672	2 ½ x 21 ½ nipple	2
I3	060051	Pressure gauge	1
J3	002454	Grease fittings	2
L3	002023	½" jam nut	8
M3	003120	2 ½" close nipple	1
N3	001503	½-13 x 1" bolt	2

	OPN	Description	Qty.
S2	003357	3 x 2 ½ bushing	1
T2	006080	GM-150 gas air mixer	1
U2	003430	1 ¼"gas gate valve	1
V2	003109	1 ¼" x 3" nipple	1
W2	004216	1 1/4' gas solenoid	1
X2	003208	2 ½" coupling	1
Z2	003434	2 ½"brass gate valve	1
B3	003230	2 ½ x 2"red. coupling	1
C3	003795	2 1/2" long radius elbow	1
E3		1912 blower	1
F3	003915	Spark transformer	1
G3	003852	8 x 10 x 4 box	1
H3	004445	UV chassis	1
K3	004226	Air pressure switch	1
L3	003914	Step down transformer	1
M3	003624	5A control fuse	1
N3	003663	Stop switch	1
O3	003662	Start switch	1
P3	102673	2 1/2"x 13 1/4" nipple	1
P4	003120	2 ½" close nipple	1
**	004177	21" alum impeller	1

** not shown in picture





The two bottom rows of bricks have 22 bricks. This includes 1 drain brick and 1 crucible support liner brick.

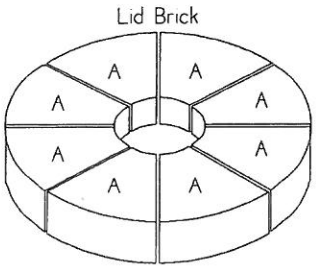
The bottom two rows also includes one large burner brick.

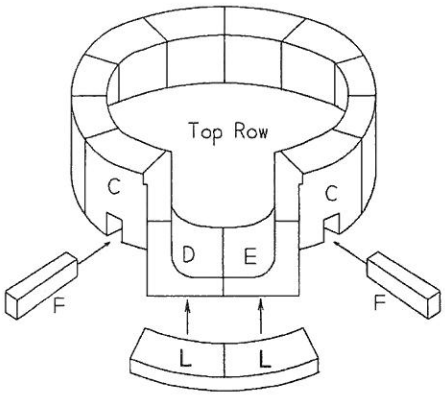
Top Row only has 12 bricks, counting 2 pour spout bricks and 2 notched crucible support bricks. Also in the top row are 2 pour spout spacer bricks. Inside dia. of top row is about 24"

A:\102800

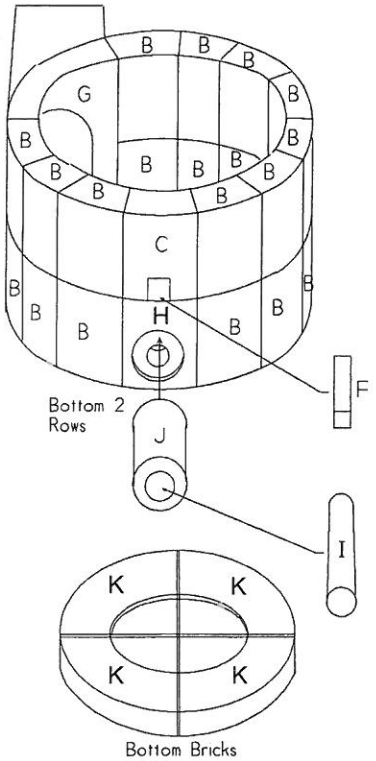
T200 Oil Fired	Special
Brick Location	
MIFCO	10/6/97

RELINING INSTRUCTION FOR T200-HT-PC FURNACE





	OPN	DESCRIPTION	QTY
A	008130	Lid Section	8
B	008131	Solid Side Liner	28
C	008132	Crucible Wedge Liner	3
D	008138	Pour spout Left Half	1
E	008135	Pour Spout Right Half	1
F	008160	Crucible Support Bricks	3
G	008090	Burner Brick - (Cast)	1
H	008139	Drain Plug Liner	1
I	008088	Drain Plug	1
J	008092	Drain Tile	1
K	008137	Bottom Brick	4
L	008134	Pour Spout Spacer	2
	008141	Matrilite Cement	1050lbs.
	008189	Minro-Fire Cement	55lbs.
	008173	RS-Sealer	4 - 20lb. Boxes



The MIFCO furnaces have been designed so that relining is rapidly and easily done. Complete relining kits are available as a package unit. These kits include all replacement refractory shapes, insulation and the correct type of refractory mortar. Structural parts of the furnace which are subject to normal abuse, and may need replacement, are available. Relining procedure is as follows:

1. Remove the burner manifold and burner from the furnace body.

2. Remove the front clamp bolt from the lid band. Spread the lid band and remove the eight (8) lid sections, "A" bricks.

3. Remove the lid lift assembly by lifting it out of the base tube. Replace lid band and lid support rods if damaged by heat. Be careful when disassembling not to lose any bearings or bushings in the jack tube.

4. Remove six (6) top seal sections around the top of the furnace by removing the hex nuts on the top of the furnace. Remove all refractory and insulation from the furnace shell. Replace seal hold down bolts if broken.

5. Mix enough of the insulation (Matrilite #28 in 30lb. bags) to fill the bottom of the shell up to the top of the brick support ribs and strike off even with the top of the ribs after the cement sets up for awhile.

6. Mix 2 of the 20lb. boxes of the RS Sealer with water to the consistentcy of thick paint. This will help to hold the bricks in place. This sealer will also be used as a mortar between the rows of bricks.

7. Locate the four sectioned Bottom Bricks and position in the bottom of the furnace in the center of the ring of bricks that were placed in the previous step. Be sure to place the indented side up and to center these bricks in the circle. Use the refractory sealer to cement the edges of these four bricks together. Locate 2 small, square bricks that are 2 1/2" high. Place the two small bricks on the cast insulation, in front of the burner area. These will be used to support the burner block when it is placed.

8. Find the large cast burner brick. Place a small amount of refractory sealer around the hole that enters into the burner chamber, against the inner burner. This sealer will help seal the two pieces together and prevent the flame from protruding out into the shell area. Push the brick back into it's final position.

9. Locate three Solid Side Liner Bricks. Dip these bricks in water, then dip the sides into the refractory sealer - one at a time. You are now ready to form your the inner chamber wall. Note on the drawing that there are three bricks (Letter B) to the left of the Front Drain Liner Brick. Place the three Side Liners into position. Make sure that the Drain Liner Brick is directly in front of the drain hole in the front of the furnace shell. After these bricks are in place, you can continue on around the circle with Solid Side Liners to complete the bottom row.

10. Now locate the 55lb. bag of MinroFire castable cement. Mix with water to a plaster like consistency. This material will be placed between the bottom bricks and the side wall of the chamber to complete the bottom of the chamber. Force the material under the burner brick, making sure that there are no air pockets. Strike off level with the bottom bricks in the chamber.

11. Locate the Drain Tile Brick (Letter J), dip in water and then one end in the refractory sealer. Place this brick in front of the Drain Liner Brick, into the indentation, and put the Drain PLug Brick (Letter K) through both bricks to help keep them aligned. Then cut a piece of plywood or steel large enough to cover the opening in the shell around the Drain Tile Brick. Cut an opening for the Drain Tile to stick through. Band this piece to the furnace shell. This will prevent the castable insulation from running out.

12. Locate the bags of Matrilite #28 (30lb. bags). Mix according to instructions on the bags, plus 1/2 pint more water per bag. Mix enough insulation to fill the area behind the first row of bricks. Fill the area up to 2 inches from the top of row one.

13. We are now ready to start row 2. At this time, mix the remainder of the Refractory sealer. Mix fairly thin. Place a layer of refractory sealer around the top of row 1 about 1/4" thick. Proceed by dipping the Solid Side Liners in water then one side in the refractory sealer. Start on the left at the Burner Brick and work your way around to the front. Locate the Crucible Support Side Liner (Letter C) and place directly in front, as shown in the drawing. Now proceed on around to the Burner Brick. This should take 7 more Solid Liners.

14. Mix enough of the Matrilite #28 insulation to fill behind row 2 up to 2" from the top of the row. We do not pour to the top of the row so that there is not a seam all the way out to the shell. This could

cause a hot spot on the shell.

15. On the top row, wet the mating surfaces between the middle and the top row. Pour a ring of refractory sealer around the top of row 2, about 1/4" thick. Set the top row of bricks down on top of row 2, being sure to work them around to get a good seal between the rows. The bricks D and E must line up with the pour spout in the furnace shell. Next, cut the bands on the top row and cement in the Pour Spout Bricks. These two bricks (D and E) will have to be supported on the outside with a board, which will also serve as a form when pouring insulation. Cut a U shaped board and place around the Pour Spout Bricks to help hold them in place and band to the furnace shell. Locate Crucible Support Bricks (Letter F) and slide them into position prior to pouring insulation.

16. Mix the remaining Matrilite #28 insulation per instructions in step 12. Do not mix the insulation for a long time. You want the mixture to be able to flow easily. It would be wise to use a vibrator or to prod the insulation with a board to insure that there are no hidden air pockets. Fill the area behind the bricks to the top, PLUS about 2" and let sit for about 1/2 hour. With the insulation about 1/2" above the top of the bricks, replace the top seal segments.

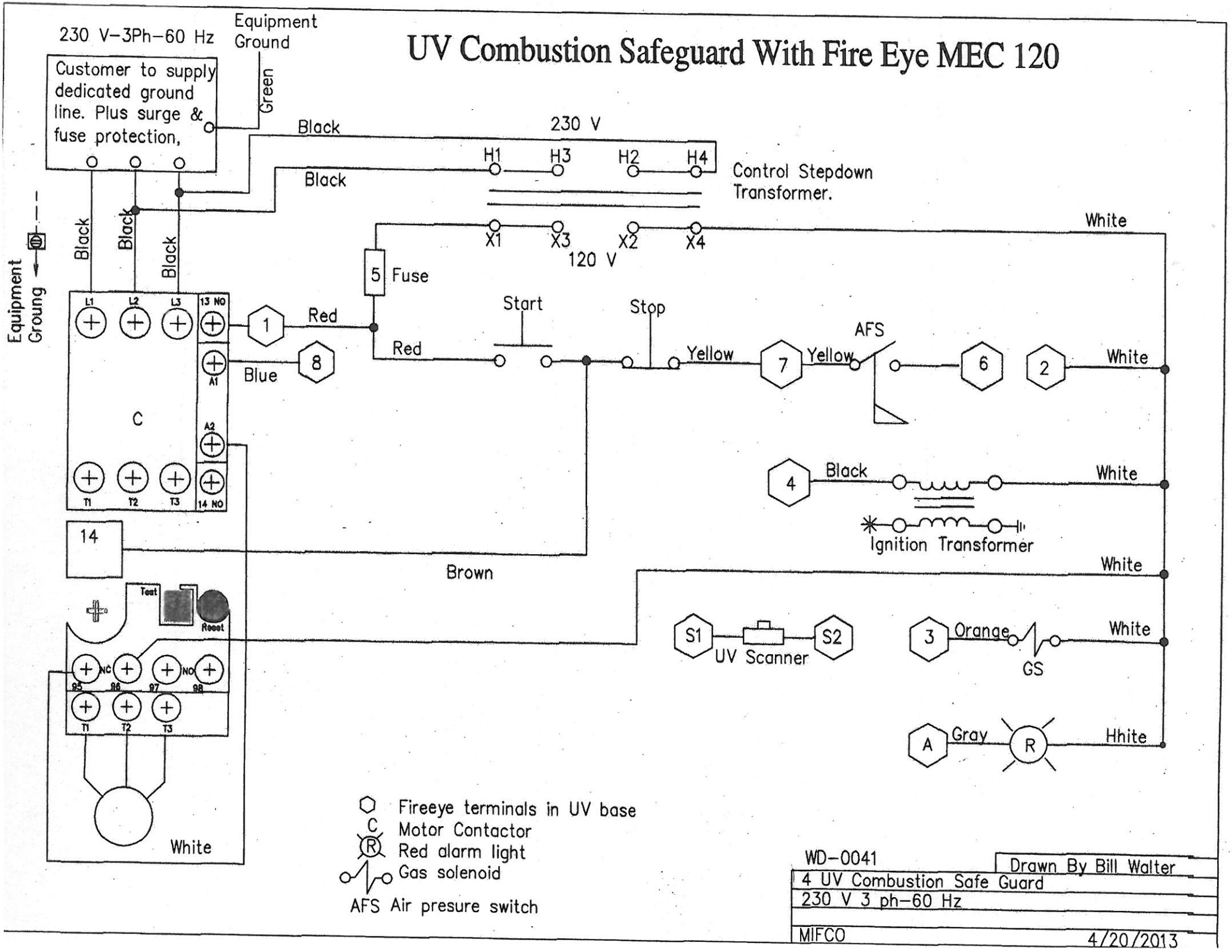
17. Replace lid brick "A" and lid band bolt and tighten until snug. Tap band with mallet. This will shift bricks slightly to allow for additional tightening. Continue this until it will tighten no more and then back the nut off one (1) turn to allow for expansion of the bricks. Over tightening will cause the lid bricks to crack when they expand from heating.

18. Add water to remaining mortar until you can brush it on and coat all surfaces of the furnace lining including the lid. **Do not get the mortar too thin** or it will come off as a powder when dry.

19. The furnace should set at least twenty-four hours to allow cement to cure. After this, the furnace should be fired slowly to dry out all moisture from the insulation and lining. Firing at Hi-Fire right away will cause steam to form in the bricks and blow them apart.

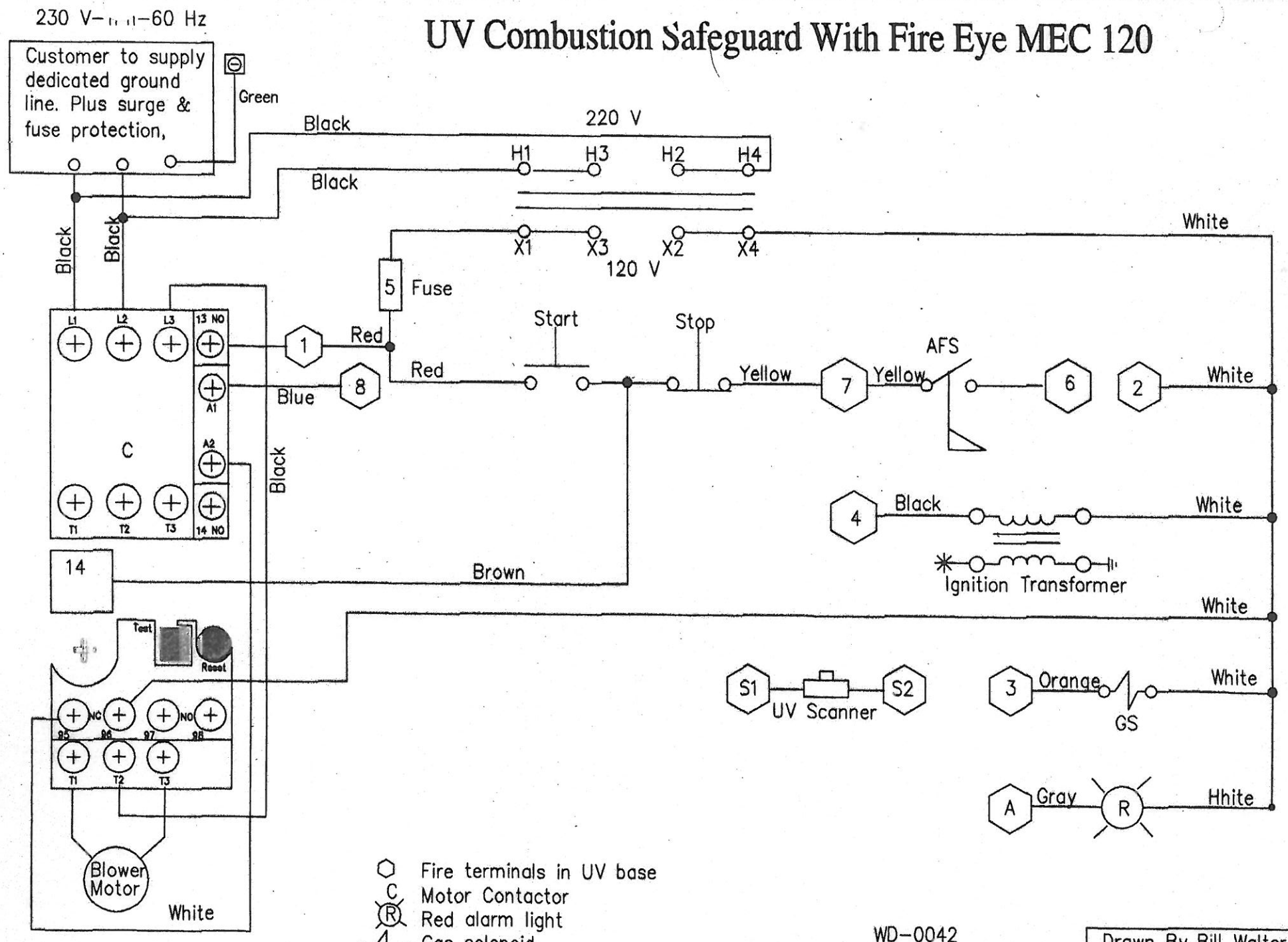
20. Put a coating of grease on the lid lift sliding parts before reassembly. Replace bricks "F" after crucible is in place. **Do not cement** these in place because they have to come out when changing crucible.

UV Combustion Safeguard With Fire Eye MEC 120



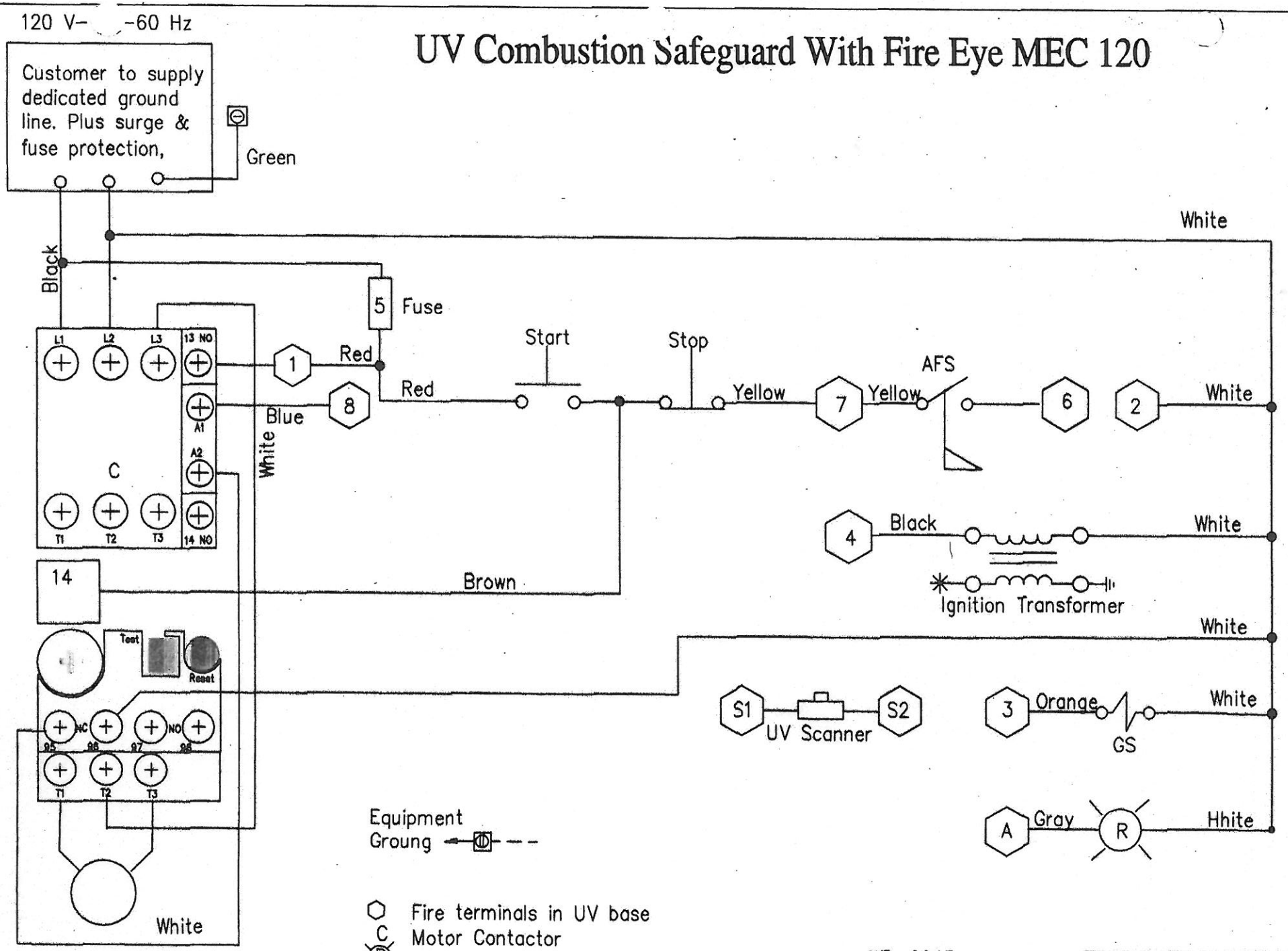
WD-0041	Drawn By Bill Walter
4 UV Combustion Safe Guard	
230 V 3 ph-60 Hz	
MIFCO	4/20/2013

UV Combustion Safeguard With Fire Eye MEC 120



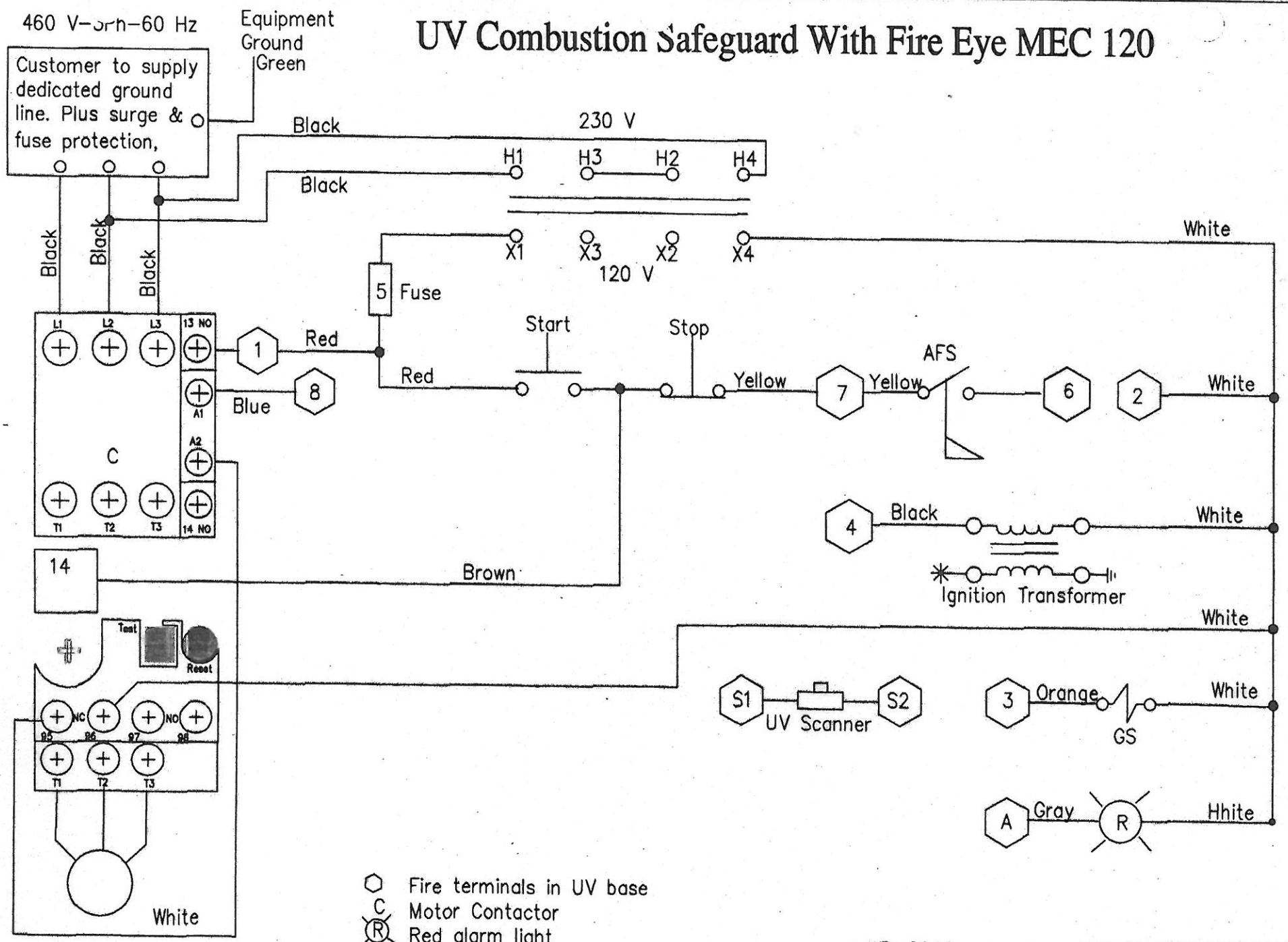
WD–0042	Drawn By Bill Walter
4 UV Combustion Safe Guard	
230 V 1 ph–60 Hz	
MIFCO	4/20/2013

UV Combustion Safeguard With Fire Eye MEC 120



WD-0043	Drawn By Bill Walter
4 UV Combustion Safe Guard	
120 V 1 ph-60 Hz	
MIFCO	4/20/2013

UV Combustion Safeguard With Fire Eye MEC 120



WD-0044	Drawn By Bill Walter
4 UV Combustion Safe Guard	
460 V 3 ph-60 Hz	
MIFCO	4/20/2013